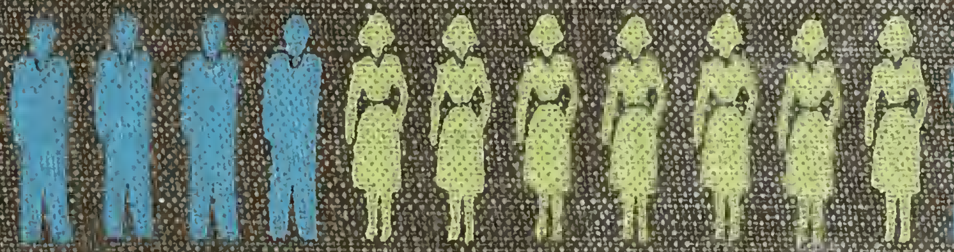
Mathematics for the Consumer



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Mathematics for the Consumer

Revised

FRANCIS G. LANKFORD, JR.

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World Book Company

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Mathematics Helps You as a Consumer

You and your classmates are already consumers of goods and services. Of course, many of your consumer problems are solved for you now by your parents or guardians, but soon many of you will be depending upon your own income to meet your consumer needs. If you are a wise consumer, you will be able to obtain much more in satisfaction and comfort from your income than if you follow your first impulse to buy or if you follow the advice of those who would profit from your lack of knowledge. Many young persons have found themselves in financial difficulty because of unwise and unbalanced buying.

To help you get some idea of the extent to which you are a consumer, let us estimate your cost of living for a year. First let's assume you are a member of a family of four persons — two adults and two teenagers. It is reasonable, therefore, to consider that you account for approximately one fourth of the family's cost of living. This table summarizes the family's costs of living and your share of that cost for a year.

Family's Estimated Cost of Living		Your Share
Food	$1600	$400
Clothing	480	120
Shelter	900	225
Insurance	200	50
Taxes	440	110
Automobile	400	100
Recreation, gifts, medical care, etc.	260	65

According to this estimate, what is your total cost of living for one year?

Now, if by operating as a wise consumer you could reduce your cost of living by as little as 10 per cent, how much would you be saving? Such a saving is not at all unreasonable, but requires good buying and good planning. Moreover, you cannot be a good consumer unless you can use simple ideas of mathematics and do the fundamental opera-

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tions with ease. However, the simple mathematical ideas and operations needed by the consumer must be understood thoroughly, for you will need to use them in a great variety of places and under many conditions. The basic ideas and operations of mathematics must be almost "second nature" to the wise consumer.

When buying food, for example, you may have to decide whether you can really save by buying in large rather than in small packages. When buying clothing or household furnishings, you will want to know how much you can save by paying cash and getting a discount or by buying at a sale. There may be a question of whether to buy a home or to obtain shelter by renting. To obtain relative costs you will need to "do your own figuring." All too often the person who is willing to do your figuring for you is likely to figure to his advantage rather than to yours.

There are some items in your cost of living, such as taxes, the amounts of which you may feel are beyond your control. However, the government does not intend that you or anyone should pay more taxes than the laws require. Hence, careful record keeping and reporting of income may mean quite a difference in the amount of taxes you pay. Moreover, through taxes you are merely buying services coöperatively. This means that, if you are to be a wise consumer through such coöperative buying, you must know whether you are getting your money's worth.

Careful planning for spending is also an essential ingredient of wise consuming. A plan to spend by is called a *budget.* Some persons do not follow a systematic plan for spending because the work involved seems "more trouble than it is worth." Many others have found that the making and following of a budget need not be either tedious or complicated. They have learned that the first element of planned spending is to anticipate the essential cost-of-living items. What is left of one's income may be spent to buy the comforts and satisfactions that make life richer.

But before you can become an efficient consumer — one who really gets his money's worth — you will need to be able to collect and interpret information about consumer goods and services. Many persons attempt to answer their consumer questions by taking the advice of friends and casual acquaintances. Others arrive at the answers by instantaneous personal decisions without bothering to look up the facts. Ordinarily, simple but careful statistical investigations would give them answers that were considerably more reliable.

Unfortunately, few persons know how to make a statistical investigation. And still fewer are competent to present statistical information after the facts have been gathered or to interpret the meaning after the details have been presented. How, then, can such persons expect to judge the soundness of the various arguments used to convince them to buy? A fundamental basis to the solving of the consumers' problems, therefore, is a knowledge of how to collect pertinent data, how to put them in understandable form, and how to get valuable information or draw true conclusions from the compiled facts. Then and only then is the consumer ready to face the buying and selling problems of everyday life.

You will quickly realize that you have previously studied some of the topics included in this book. There are two important reasons why it is especially desirable for you to come back to these topics now. First, you are rapidly approaching the time when the problems of the average consumer will confront you in your daily living. Second, you are now better able to grasp the meanings of these problems and to understand the accompanying explanations. Genuine problems for you on insurance, taxation, investment, and installment buying — problems of the type encountered in normal living — can now be presented in their real settings.

And, by taking part in the *special investigations* suggested throughout the book, you will be helped in your comprehension of each subject as it is discussed. For example, food and clothing prices vary tremendously, property taxes vary throughout the country, rates for borrowing money are different in the various states, and automobile insurance costs depend on location and use of the vehicle insured. It is impossible in any textbook to make allowance for all these variations. Participation in the special investigations will enable you to make the problems realistic and more valuable by the use of current prices and the consideration of existing local conditions in your own community.

There are three significant goals that you will be able to attain through your study of this course in consumer mathematics: (1) You will learn to use mathematics with the competence demanded of today's high school graduate; (2) you will be a more intelligent and a more efficient consumer of the goods and services offered to the American people; (3) you will be a more intelligent reader because you will have a better understanding of the mathematical language that is today so widely used in newspapers and magazines to keep the consumer adequately informed.

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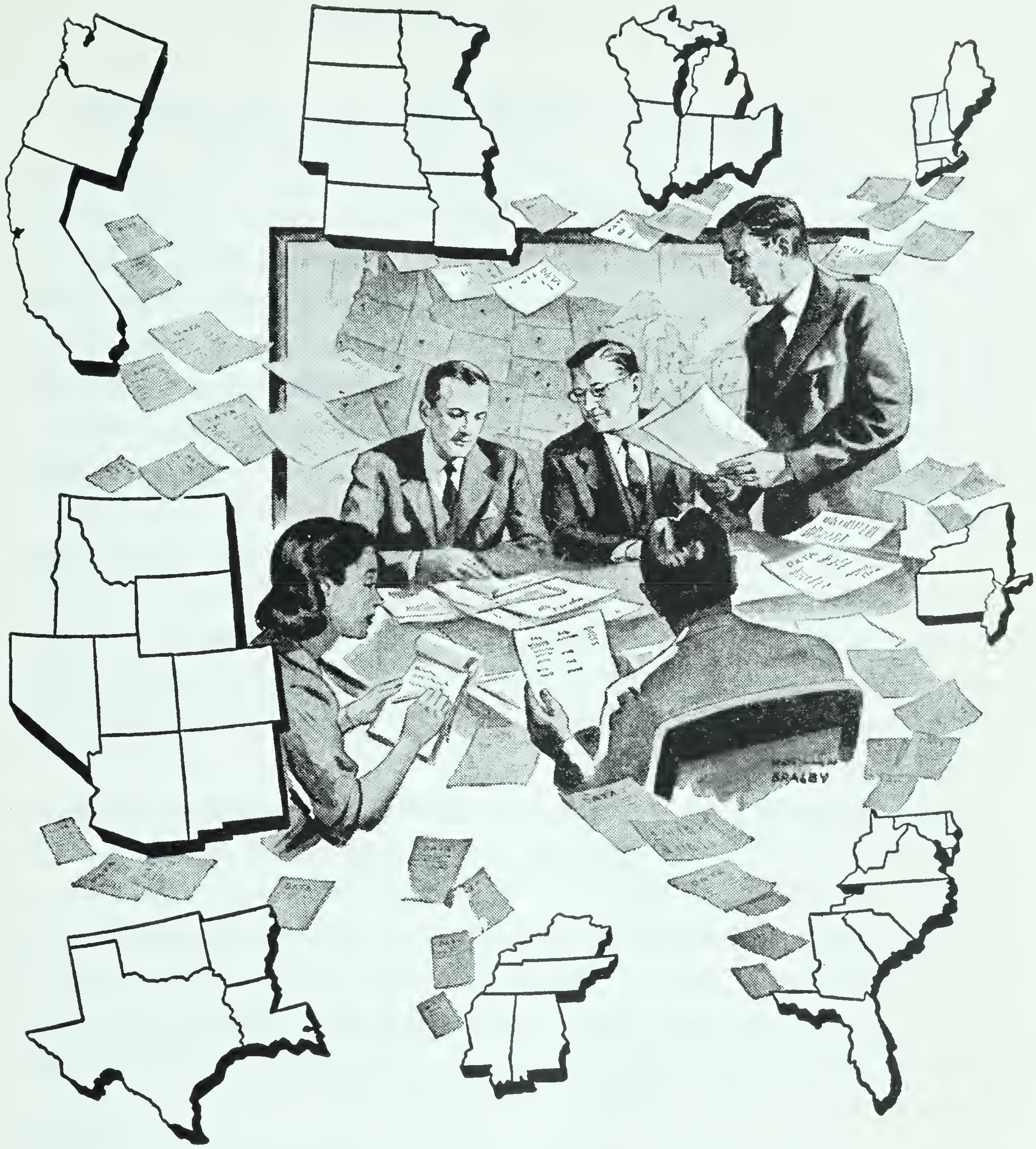

UNIT I

How to Handle Statistics

The Consumer Uses Simple Statistics

Throughout your lifetime you will be faced with problems in consumer mathematics for which you will need to make simple investigations to help you decide what course of action to follow. For example, owning and operating an automobile is a large cost-of-living item for a person or a family. If you are to keep the amount of this item as small as possible, you must know what expenses produce the cost and in what proportion each expense is distributed. What is the cost of gasoline, of maintenance, of insurance, of depreciation (decline value)? How are the amounts of these costs influenced by the number of miles a year one drives, by the age of the car, and other considerations? To answer such questions you will need to collect, organize, and interpret numerical information. This means that you will be using *statistics,* which is simply the systematic collection, presentation, and interpretation of numerical facts. In statistics, the numerical facts are called *data.*[1]

A statistical study or investigation may be about employment in the television industry, the weather, the attendance at the last school dance, the national income, a Presidential election, production of atomic energy, or baseball scores. As a result of your study of this unit you should be able to collect data wisely for your own uses; to judge the worth of data collected by others; to organize and present statistical data yourself when the need arises; and to make the correct interpretation of data that may be presented to you.

Not only will a study of simple statistics help you in investigating consumer problems on your own, it will also help you to become a more intelligent reader of newspapers and magazines. For example, if you do not understand averages and index numbers, you will be unable to read many worth-while articles in newspapers and magazines.

Incidentally, there is another advantage in studying simple statistics at this point in your education. Increasingly, problems of government, industry, business, economics, science, and education are being studied statistically. Naturally, more persons qualified in the field of statistics are needed. As you study this first unit, you may become interested in the field of statistics and decide to go further in it.

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[1] The word *data* (dā′tȧ) is plural. We say "the data *are.*"

PROBLEM I

What Are the Things to Look For in Consumer Problems?

The preceding statements should help you to realize why this first unit in your study of consumer problems deals with statistics. The pages immediately ahead are intended as "warming-up exercises." They will also help you to see what abilities you may need to develop to help you to solve word problems of the sort you will meet in *Mathematics for the Consumer.*

Deciding what operations to use.

Read each of these exercises carefully, then tell whether you need to *add, subtract, multiply,* or *divide* to solve the problem. In some cases you will need to use more than one operation. You need not complete the operations. The first one is done for you as a sample.

1. What is the cost of 5 pounds of oranges at $8\frac{1}{2}$ cents a pound?

You multiply $8\frac{1}{2}$ cents by 5.

2. A large can of fruit juice containing 35 fluid ounces is on sale for 28 cents. How much is this per ounce?

3. A radio can be bought for $90 cash or for $6 down and $11 a month for 8 months. How much more will it cost to buy the radio on time?

4. Mr. Paulsen's income last year amounted to $4500. His exemptions and deductions amounted to $2900. He paid 22% (22¢ on each $1) income tax on the balance. How much did he pay in income taxes?

5. Pete Basher had 5 United States Savings Bonds, for which he paid $18.75 each. When he cashed them in, he received $25.00 for each one. How much more did he receive than he paid in for the 5 bonds?

6. At age 15 Sally Rives can buy a $1000 life insurance policy for $18.25 per year. How much will she have paid in premiums by age 65?

7. Mrs. Wells' grocery bill today included 6 cans of soup @ 2 for 29 cents, 4 pounds of grapes @ 2 for 33 cents, 2 loaves of bread @ 17 cents a loaf, and 3½ pounds of roast @ 79 cents a pound. What was her total grocery bill?

8. Hank Greer borrowed $120 from a bank and paid it back $10 each month. Hank figured he owed the bank $120 the first month, $110 the second month, and so on for each month to $10 the last month. In all, this means a total of $120 + $110 + $100 + $90 + $80 + $70 + $60 + $50 + $40 + $30 + $20 + $10 or $780 for one month. The bank charged a total interest of $7.20. What rate of interest is this per month on $780? What rate of interest is it per year?

Deciding when you need more information.

For each of these problems indicate the additional information needed before the problem can be solved.

1. Mrs. Amory can buy a large box of cereal for 29 cents or a small box of the same cereal for 18 cents. How much more economical is the large box than the small one?

2. Harold Wireton bought a topcoat in a 20% off-season sale. The alterations cost him $2.50. How much did he save by buying during the sale?

3. Bruce Forbes says he gets 20 miles per gallon of gasoline when he drives his car at an average speed of 40 miles per hour. He gets only 17 miles per gallon when he averages 60 miles per hour. How much will he save on his vacation trip if he drives at an average of 40 miles per hour instead of at an average of 60 miles per hour?

4. In Phyllis Trilby's home state automobile license fees are paid according to the weight of the car. If the Trilbys' car weighs 3320 pounds, how much will the license fee be?

5. Grace Arents has a life insurance policy on which she pays $154.28 a year. Nina Beatley has a policy in another company on which she pays $124.19 a year. Both girls are the same age. Which has the better insurance policy?

6. The Riverdale school district is building a new high school. To pay off the bonds, the district increased property taxes from $2.50 per $100 to $3.15 per $100. How much will this increase the taxes which Mr. Hampden, a resident of Riverdale, will pay on his home?

7. Mrs. Kleeton borrowed $150 with which to buy a washing machine, and she paid $9 interest on the loan. Mrs. Bender borrowed $150 to buy a stove, and she paid $6 interest on the loan. Which person paid the smaller rate of interest?

8. Mr. Jeter has just bought a top-grade all-wool overcoat. He says he gets 50% more wear from such a coat than from one that would cost $20 less. If his statement is true, will he save money by buying the more expensive coat?

Practice in careful reading.

One of the remarkable developments in the United States in the short period of one generation is the huge increase in savings of the thousands of Americans who have moderate or small incomes. In 1951 these savings were accumulated principally in life insurance, mutual savings banks, and savings and loan associations, where the total was well over $100 billion. This amount is more than double what it was a decade ago and some seven times as much as in 1920. The 1951 total was actually $110.8 billion; in 1940 it was $48.4 billion; and in 1920 it was only $15.3 billion.

Even more significant than the dollar gain in savings is the record number of persons who are now regularly saving through various thrift institutions. This vast number of the American people now have a direct financial interest in the industrial and economic progress of the country, for the security of their savings is dependent upon this progress as it never has been before. The number of life insurance policyholders, for example, reached 86 million in 1952, an increase of some 20 million in the last decade alone and well over double the number in 1920. Then, too, there were an estimated 67 million persons in 1952 with thrift accounts in savings and commercial banks and in Postal Savings, a number half again as great as in 1940.

The thrift institutions invest people's savings in many ways. Over 40 per cent of the assets of life insurance companies was invested in business and industry in 1952; more than a quarter of these assets were invested in real estate mortgages and about one fifth were in government securities.

Mutual savings banks invest their holdings primarily in government securities and real estate mortgages. Only about a tenth of their holdings are invested in business and industry. On the other hand, most of the funds held by savings and loan associations are invested in real estate mortgages.

All together, $44.6 billion of the savings the people of our country had accumulated in life insurance, mutual savings banks, and savings and loan associations in 1951 were invested in real estate mortgages; $30.6 billion were invested in business securities; $25.2 billion were invested in government securities; and $10.4 million were in other securities.[1]

Questions Based on Your Reading

1. The people's savings were held principally by what three types of thrift institutions in 1951?

2. The total savings in these three institutions were about how many billion dollars in 1951?

3. In 1940 the savings amounted to about what fraction of the amount in 1951?

4. Did this increase in savings result from a few persons' saving a great deal more or from the small savings of many more persons?

5. About how many people held life insurance policies in 1952? The number of life insurance policyholders was about 20 million less in 1940, or about how many?

6. Do life insurance companies invest a larger or smaller part of their holdings in business and industry than do savings and loan associations?

7. Which of the three savings institutions invest most of their holdings in real estate mortgages?

[1] Adapted from *Money Matters*, July, 1952. Published by The Institute of Life Insurance.

8. Write entirely in numbers: 86 million; $110.8 billion.

9. What does it mean to say that the 67 million persons who held thrift accounts in savings and commercial banks and in Postal Savings in 1952 was a number "half again as great as in 1940"?

10. With 40 per cent of the assets of life insurance companies invested in business and industry, one quarter in real estate mortgages, and one fifth in government securities, what per cent does this leave to be invested in other places?

Making reasonable estimates.

A person who estimates the answers to problems before he computes them seldom makes absurd errors. Moreover, he is more likely to make the computation correctly because he thinks the problem through before he starts. In each of these problems estimate the answer first. You should need your pencil very little, if any, for this.

1. Mr. Hughson borrowed $12,150 to buy a home with. The savings and loan association charged him 5% interest. How much interest must he pay a year?

Think: The interest for a year on $1000 at 5% is $50.
$12,150 is a little more than 12 times $1000.
So the interest on $12,150 is a little more than 12 × $50, or $_?_.

2. Mr. John Rickey kept a record of the gasoline he used and the miles he drove his car the first year he owned it. His record showed 12,172 miles and 794 gallons of gasoline. How many miles did he average per gallon of gasoline?

Think: 12,172 miles is about 12,000 and 794 gallons is about 800.
The average is about $\frac{12000}{800}$ or $\frac{120}{8}$ or about _?_ miles per gallon.

3. The Rough Wear Shoe Company has a monthly payroll of $64,400. How much does it pay the government in social security taxes at $1\frac{1}{2}$ per cent?

Think: 1% of $64,400 is $644. $\frac{1}{2}$% of 64,400 is thus _?_, and $1\frac{1}{2}$% of $64,400 is $644 + _?_ or _?_.

4. In 1920 there were 289,000 farms in this country under 10 acres in size. In 1950 there were 511,000 such farms. This represents what per cent increase in 30 years?

Think: This is an increase of some over 200,000 farms.
289,000 is about 300,000, so per cent increase is about $\frac{200000}{300000}$ or __?__.

5. The people of the United States bought about $150,600,000,000 in goods from retail stores in 1951. The population of the United States in 1951 was approximately 151,000,000 persons. What was the approximate average expenditure in retail stores per person?

Checking your work carefully.

There are two ways to check your work in *Mathematics for the Consumer.* One of these you have just used. It is to decide whether or not you have a reasonable answer by estimate. Used regularly, this method will avoid many mistakes for you. Generally, however, you need to use a mathematical relationship to make the check. These exercises illustrate the second method of checking.

(1) *Checking addition:*

Hank's expense account shows these items for last month: movies $1.10, school supplies $2.13, lunches $5.25, bus fare $2.94, football game $1.55, church $2.00. What were his total expenses?

$$\begin{array}{r} \$\ 1.10 \\ 2.13 \\ 5.25 \\ 2.94 \\ 1.55 \\ \underline{2.00} \\ \$14.97 \end{array}$$

To check:

Adding down the column, Hank got $14.97 for the sum.
Adding up the column, Hank should get __?__ as a check.
Here Hank uses the mathematical principle that:

In addition the order in which the addends are combined has no effect on the sum.

(2) *Checking subtraction:*

Jane Evans' bank account showed a balance of $215.23 before she drew a check for $29.17. What is her new balance?

$$\begin{array}{r} \$215.23 \\ -\ \underline{29.17} \\ \$186.06 \end{array}$$

To check:

You simply *add* $186.06 and $29.17 to see if it gives you $215.23. Does it?

Here we use the fact that *subtraction is the inverse of addition.*

(3) *Checking multiplication:*

A suit priced at $45 is to be marked down 25% at a sale. How much should it be reduced?

$$\begin{array}{r} \$45 \\ \underline{.25} \\ 225 \\ \underline{90} \\ \$11.25 \end{array}$$

To check:

You multiply .25 by 45 to see if it gives you 11.25. Does it? Here we use the principle: *In multiplication the order in which the factors are multiplied has no effect on the product.*

(4) *Checking division:*

The Howards' family budget includes $150 for fuel. What is the average monthly amount allowed for fuel?

$$\begin{array}{r} \$12.50 \\ 12\overline{)\$150} \\ \underline{144} \\ 60 \end{array}$$

To check:

You multiply $12.50 by 12 to see if it gives you $150. Does it? Here we use the fact that *division is the inverse of multiplication.*

Practice in Checking Problems

Try the second method of checking as you work these problems.

1. The Kelsons' monthly electric bills last year were as follows: $7.92, $8.04, $9.15, $10.29, $8.93, $9.92, $10.34, $11.02, $9.87, $10.13, $8.78, $10.11. What was the total for the year?

2. The Kelsons used 918 gallons of fuel oil last year. How much did this cost them at 13 cents per gallon?

3. Mr. Kelson figures it cost him $549.90 to drive his car last year. He drove it 12,220 miles. How much did it cost him per mile?

4. Last year Mr. Kelson's taxes on his home were $254.87. This year they are $272.19. How much more did he pay this year?

5. If Mr. Kelson puts $18.75 in a savings bond every month for the next 10 years, how much will he have invested at that time?

6. Mr. Kelson's fire insurance on his home cost $85.13, the last time he paid it. His present bill is $67.89 because there is now a fire plug near his home. How much saving does this represent?

7. Food for the Kelson family cost $940.00 last year. Mrs. Kelson thinks she can reduce this cost this year, by careful buying and planning, to $880.00. What per cent saving will this represent?

Harold M. Lambert from Frederic Lewis

A sample poll must be representative of all the persons involved.

PROBLEM II

What Guides Should Be Followed in Collecting Data?

When anyone collects data concerning a question in which he is interested, he must be careful in making his collection. He must be sure that he has the right kind of data. It is possible for an investigator to collect data and work with them accurately and correctly, yet arrive at false conclusions because the data themselves were no good in the beginning. It is, therefore, highly important to know what kinds of data are useful; that is, what characteristics worth-while data should have. There are three guides which, taken together, enable us to judge whether suitable and useful data are being collected.

Sample data must be representative.

A number of years ago, a magazine (widely read at that time) conducted a nation-wide poll, or straw vote, on a Presidential election. Ballots were mailed to 10 million voters, and more than 2 million ballots were marked and returned. On October 31 the final report on the poll was made. The result was 1,293,669 straw votes for candidate A and 972,897 votes for candidate B. In the election a few days later, candidate B was elected by an overwhelming majority.

At the same time the magazine was conducting its poll, Dr. George H. Gallup was taking another poll on the election. The Gallup poll did not obtain straw votes from nearly as many persons as did the magazine. But Dr. Gallup consistently picked candidate B to be elected. His prediction as to how many votes each candidate would get was in error by only slightly more than 6 per cent.[1]

Why do you think the large poll of the magazine gave an incorrect prediction, whereas the smaller Gallup poll made a correct prediction? The answer seems to be found in the ways in which the two polls selected their sample voters; that is, in the kind of data each collected. Dr. Gallup's smaller sample of voters was probably a much better sample of all the voters in the entire country. It was selected so as to be *representative* of the whole voting population. The magazine's sample poll did not represent all the voters who cast ballots.

Then came another Presidential election when all the "pollsters," even Dr. Gallup, made *wrong* predictions. Public confidence was so shaken in the predictions of such straw polls that their popularity waned overnight and newspapers and magazines stopped publishing them. A group of the country's leading statisticians tried to find out why the predictions had been wrong. They concluded, in general, that representative data had not been secured, but for a very special reason. The sample straw votes were obtained several days in advance of the actual election, and, during those several days, many persons changed their minds. The data compiled from the straw votes were not representative of the people's views on election day. Also, the straw votes indicated a close election and, therefore, the "pollsters" should not have announced their predictions with such certainty.

These incidents illustrate the difficulties involved in securing a representative sample for use in a statistical study. Two general methods are used for obtaining samples. One method is to get a *simple random sample*. Drawing names from a hat, or taking every tenth name from an alphabetical list, are examples of simple random sampling. Using a *stratified random sample* is a second method. It is the method used in most straw polls. In this second method it is first necessary to decide on the size of the sample that will be used. Then it is necessary to decide on the various groups (*strata*) in the population that are truly representative of the whole and to determine what per cent of the whole each group represents. Finally, it is necessary to select at random from each group the same per cent of the total sample as that group represents in the entire population. Although a stratified random sample is usually difficult to obtain, it is often more representative than a simple random sample. Below you will see how the stratified-random-sample method operates.

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[1] TO THE TEACHER. Those members of the class who seem to have difficulty in understanding per cents should be referred to pages 393–402 for review.

Imagine we are conducting a straw poll of the student body of a school on such a question as, "Should our school day be shortened a half-hour in order to give more time for work experience out of school?" In this example we shall select a 20% stratified random sample from the 1000-member student body (population).

HIGH SCHOOL ENROLLMENT BY GROUPS

GROUPS	TOTAL SCHOOL ENROLLMENT		NUMBER IN SAMPLE
	Number of Students	Per Cent of Whole	
Freshmen...	350	35	70
Sophomores.	277	28	?
Juniors.....	213	21	?
Seniors.....	160	16	?
Total.....	1000	100	200

Since we have decided to use a 20% sample, we must poll 20% of 1000, or 200 students. Next we decide that it is important to have each of the four classes in the school properly represented in the sample. So we look at the school records and find that 35% of the 1000 students in the school are freshmen, 28% are sophomores, 21% are juniors, and 16% are seniors. Hence 35% of our sample of 200, or 70 students, must be chosen at random from the 350 freshmen; 28% of 200 must be chosen at random from the 277 sophomores, and so on. Taking every fifth ($\frac{1}{5} = 20\%$) name from an alphabetical list of each class would be a good way to choose at random the number needed in the sample.

If you conduct such a poll in your own school, of course you will have to arrange to use enrollment data from the school records. It would be interesting, if possible, to conduct a poll and make a prediction, and then have your class sponsor a project in which all the students voted. Then you could check the accuracy of your prediction.

Questions to Discuss and Things to Do

1. In the sample problem stated above, how many sophomores should be chosen for the sample? how many juniors? seniors?

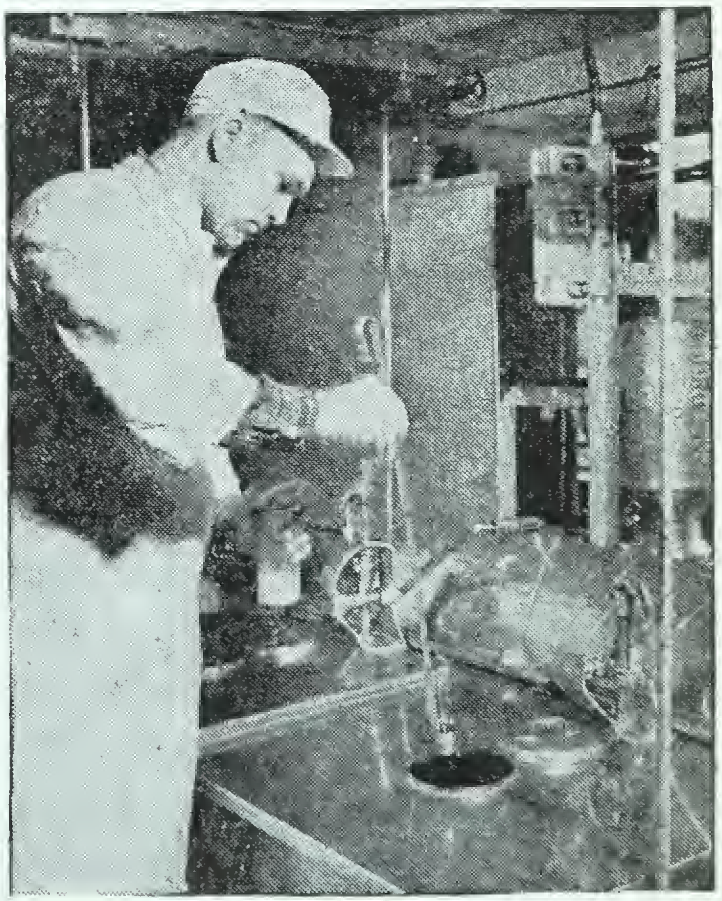
2. The Lafayette High School enrolls 640 students. Of these, 211 are freshmen, 186 are sophomores, 141 are juniors, and 102 are seniors. How many from each class should be chosen for a 30% stratified random sample?

3. At the Marshall High School the students are conducting a straw vote on the question: "Should more boys take homemaking and more girls take shop?" They decided that for this problem the representative groups to be chosen in a sample are the boys and the girls rather than the classes. There are 220 boys and 260 girls. How many of each should be chosen for the 15% stratified random sample?

4. What would you consider representative data on these questions?

(*a*) Do the students who are graduated from your school have better jobs than those who have dropped out before graduation?
(*b*) Are the girls better than the boys in their schoolwork?
(*c*) Are the athletes better than other boys in their schoolwork?
(*d*) What per cent of the graduates of your school obtain jobs with which they are satisfied?

5. There are laws which set standards for certain food and manufactured products. It is the general practice for inspectors to obtain samples of these products and to analyze them to see if they meet the legal specifications. The analysis of milk by health departments is a good illustration. It is obviously impossible to analyze all the milk used by a city every day. Fortunately only samples need to be analyzed. Find out how these samples are selected so as to be representative.


Borden Company

Obtaining a representative sample of milk for testing.

6. Class committees may wish to determine how samples are selected in testing (*a*) a water supply, (*b*) fertilizer, (*c*) gasoline, and (*d*) meat, fruit, and vegetables for grading.

Data must be comparable.

It was the coldest morning of the winter, and Dr. Allen had discovered that the radiator of his car had frozen during the night. When he finally reached the laboratory where he was chief research chemist, he asked his assistant, "How cold do you suppose it was last night, Arthur?"

"The thermometer at home registered 20 when I got up this morning. But the temperature is usually lowest shortly after midnight, so it must have been down to 15 during the night."

"Oh, it was colder than that. I have a maximum-minimum thermometer on my back porch and it registered a low of 5 degrees above zero," Dr. Allen stated.

Turning to the morning paper, Dr. Allen's assistant answered, "The weather bureau reports a low of 12 above zero."

"That doesn't mean a thing," Dr. Allen said. "The weather bureau is over in the park and protected. It never gets as cold there as it does on my back porch up on the hill."

That ended Dr. Allen's discussion of the weather. He and his assistant had other things to do. But their conversation shows how important it is for data to be of the same kind before one can safely draw conclusions. If Dr. Allen's thermometer was read on Tuesday morning and the weather bureau's report was read on Wednesday morning, any conclusion as to Wednesday being colder or warmer than Tuesday would not be based on comparable data. If we wish to compare the temperature this month with the temperature for the same month last year, shouldn't we have to obtain our data from the same place? In order to be comparable, data must be obtained under the same or very similar conditions.

Sometimes data are not comparable because different units have been used in measuring the things that are to be compared. Let's imagine, for example, that Dr. Allen says that his thermometer at home registers 104° on a hot summer day and that his assistant insists that the laboratory thermometer registers only 40°. If Dr. Allen has read a Fahrenheit thermometer and his assistant has read a centigrade thermometer, the temperatures they reported are actually identical. Data must be expressed in the same units of measure when they are to be compared.

U. S. Weather Bureau

This scientist of the Weather Bureau is working with data on the wind. Statistics on weather conditions are important in many lines of work, especially in aviation. The data collected must be comparable, from day to day, from year to year, and as between different points of observation.

There is yet a third characteristic which data must have in order to be comparable. Suppose that you measure a line and that you record your measurement as $23\frac{1}{2}$ feet. Suppose, further, that a classmate measures another line and records 23 feet and $4\frac{3}{16}$ inches. Can you tell from the recorded measurements which of these lines is the longer? May they not actually be the same length if one was measured to the nearest sixteenth of an inch and the other to the nearest half foot? Measured to the nearest half foot, your classmate's line is $23\frac{1}{2}$ feet. Comparable data must be given with the same degree of precision.

We have seen three different ways in which data must be comparable. If statistical data fail to meet these three requirements, it is not safe to draw conclusions from them. To be sure that you understand what is meant by comparable data, you should be able to illustrate, with data of your own choosing, each part of this statement:

In order that data may be comparable — (1) they must be obtained under the same or similar situations; (2) they must be expressed in the same units of measurement; (3) they must represent the same degree of precision in counting or measuring.

Questions to Discuss and Things to Do

1. In discussing whether it is cheaper to cook with electricity or with gas, Mrs. Smith said that it cost her $6 per month to cook with electricity. Mrs. Jones said that it cost her $5 per month to cook with gas. Can you draw any general conclusion as to comparative costs of gas and electricity from these data? Why?

2. A class in home economics was investigating the problem whether it is cheaper to buy or to rent a home. Mary Cox reported these facts:

(*a*) The Barth family pays $40 per month rent.

(*b*) The Kraft family owns its home, pays $100 per year taxes, $80 for repairs, and sets aside $200 per year for depreciation.

In what way do these data fail to be comparable?

3. Suppose you have been asked to investigate the possibilities of a family's saving money by buying foods of the protective group (shown below) in large rather than in small quantities. If you obtained the following data, could you draw correct conclusions from them?

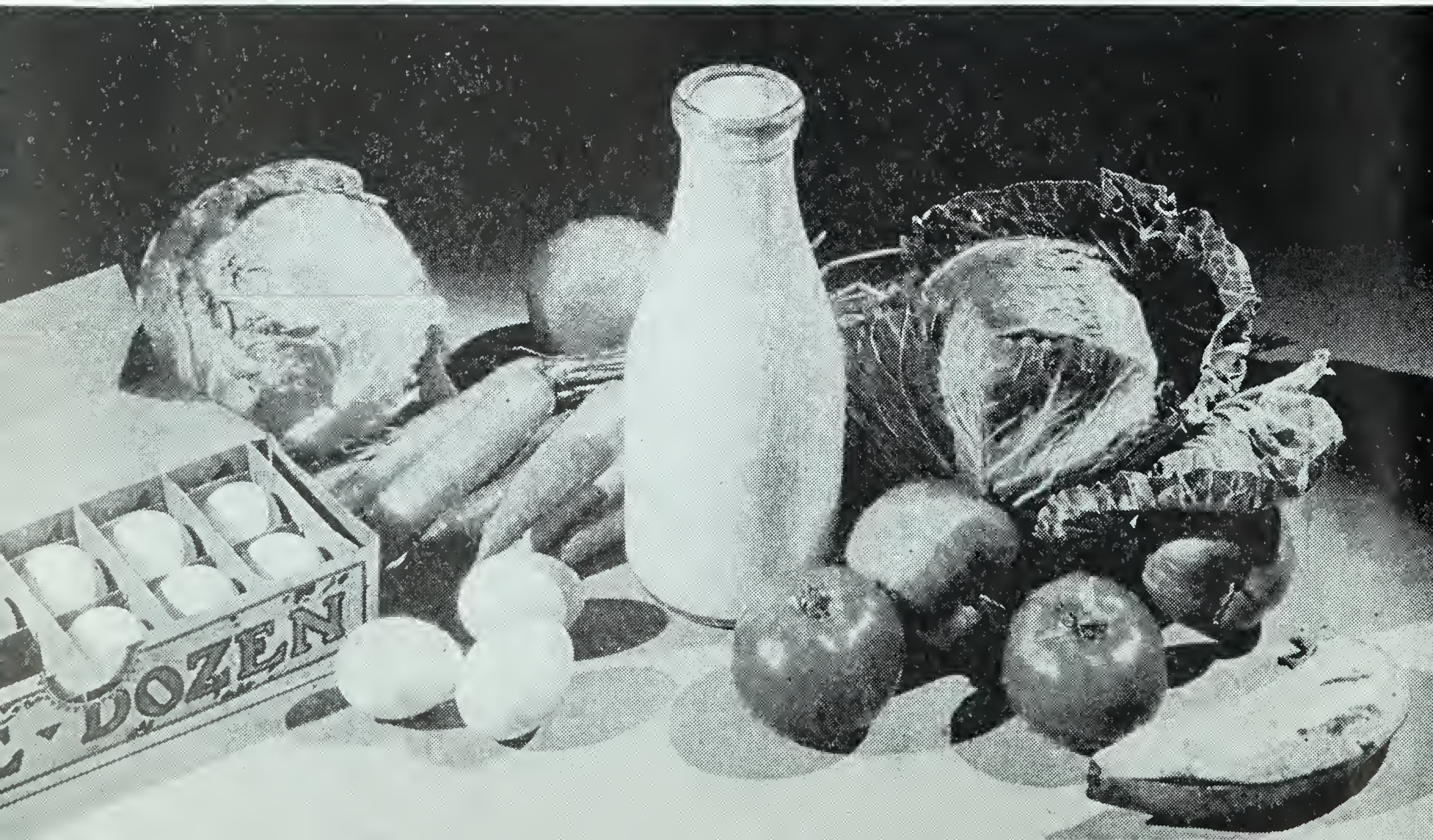
(*a*) Select eight or ten articles of food in the protective group and find the cost per ounce when bought in large quantities and when bought in small quantities.

(*b*) Find out whether the typical family has adequate space to store and preserve such food that is purchased in large quantities.

(*c*) Find out whether all food in large quantities is likely to be used.

Typical foods in the protective food group which are rich in vitamins C and E.

National Dairy Council



4. A garage mechanic was asked to determine whether Mr. Baldwin's car or Mr. Jackson's car was the more economical as regards gasoline consumption. He collected these data:

(*a*) Miles per gallon for each car when driven on a 200-mile trip
(*b*) Average speed and maximum speed at which each car is ordinarily driven by its owner

Has the mechanic obtained comparable data on the two cars? Give reasons for your answer.

5. One often hears the statement that the income of farmers is low. What data would you need to have before you could compare the annual income of a factory worker or a businessman who lives in the city with the annual income of a farmer whose family lives on the farm?

6. "Real wages" is the amount a workingman earns when his pay is expressed in terms of how much it will buy. Explain how real wages may provide data that are more comparable than money wages in considering incomes in different sections of the country.

7. Mary Anderson says she lives 2 miles from school. Jim Barnes says he lives 2 miles and 528 feet from school. Can you compare these two distances and conclude that Jim lives 528 feet farther from school than Mary? Why?

8. If you were reporting the Federal income tax by states, how would you report these amounts of taxes so that they would be comparable in degree of accuracy?

$533,000 $104.8 million $11.32 million
$16,774,000 $ 48.0 million $14.68 million

9. Plan an investigation that will show the per cent of pedestrians who cross the street against the traffic light at some busy intersections. Be sure that your plan provides for obtaining both comparable and representative data. (You make the plan only; you need not carry out the actual investigation.)

10. A pursuit plane was observed to fly at a speed of 450 miles per hour. The same observer later saw another type of pursuit plane traveling 600 miles per hour. Can you be certain that these observations produced comparable data? Give reasons for your answer.

Revere F. Wistehuff

Data must be relevant.

Miss Hoyt and Mr. Jackson, two teachers of science, were discussing their students' interests in science. Miss Hoyt told of reading a report of an investigation in which a science teacher gave her students a long list of items related to science, and asked them to check the items in which they were most interested. In this way the teacher claimed to have discovered the real science interests of her class.

Mr. Jackson's comment was, "I don't believe she found what she was looking for, because the data she collected were not *relevant*."

"What do you mean?" Miss Hoyt asked.

"I mean the teacher did not obtain information that helped directly in answering the question as to what are the students' interests. I believe that when students are asked to check such a list, they are likely to indicate interests that they think the teacher will approve, rather than their true personal interests."

"I guess you are right," Miss Hoyt replied. "Do you think there is a good way to get relevant data on students' interests?"

"Maybe there isn't any practical way," said Mr. Jackson. "I have read about a plan that seemed reliable to me. The investigator tabulated a great many science questions that high school students voluntarily sent to the question-and-answer box of a magazine. It seems to me that those questions indicate directly the real interests of the students who asked them. Therefore they constitute relevant data."

Do you agree with Mr. Jackson that this procedure which he reported would obtain data that would help directly to answer the question, "What are the real science interests of high school students?"

Do you think the data could be called representative? That is, do you think the group who voluntarily sent questions to the magazine are typical of all high school students?

Mr. Jackson correctly insisted that data must have the very important characteristic of *relevance.* If data are not relevant, they are not useful in an investigation. However, it is sometimes difficult to decide whether or not data are relevant. Perhaps the best guide in helping you to judge the relevance of data is this definition: Relevant data are those which enable an investigator to obtain the true answer to his question or problem for which the data were collected.

Frequently one must have some information in addition to that present in the data themselves in order to determine the relevance of the data. Moreover, statistical investigators must often carry out careful supplementary or check studies to test the relevance of their data. The situation in the next paragraph illustrates how additional information may help determine whether or not data are relevant.

In a report in a science class, James Bates stated that Arizona has the highest death rate from tuberculosis of all the forty-eight states. He concluded from this fact that Arizona must have a very poor system of tuberculosis prevention and care of patients who contract the disease.

At the conclusion of James's report, a keen student promptly pointed out that the death rate from tuberculosis is high in Arizona because many persons who have the disease in advanced stages go there to seek cure through the healthful climate. This additional information convinced James that his conclusion was based on irrelevant data.

Data may be relevant for one purpose but not for another. For example, the strength and the durability of metals would be highly relevant data in selecting building materials for a skyscraper. If, however, you were selecting materials for building an airplane, you would consider also the data on their density, or weight; strength and durability alone would not be wholly relevant. Always, therefore, data should be checked and tested by the definition of relevance before they are used in arriving at conclusions.

Questions to Discuss and Things to Do

1. Mr. Gresham wanted to find out whether an available site in his town was a good one for a grocery store. He decided to obtain a count of the pedestrians who passed in front of the site between 7:00 A.M. and 6:00 P.M. on one day. He thought that the number would be useful in determining the desirability of the site.

Under which of the following conditions do you think Mr. Gresham's data would most likely be relevant for his problem?

(*a*) The site was near a large factory and a great number of workers walked by it going to and from work.
(*b*) The site was near a school and a large number of children walked by it going to and from school.
(*c*) The site was close to a large residential section.

2. Helen Porter wanted to prepare a report on the causes of fatal highway accidents. She considered the following kinds of data. Which do you think are the most relevant to her problem? Why?

(*a*) Speed at which cars were being driven when accidents occurred
(*b*) Causes reported by witnesses of accidents
(*c*) Condition of road on which greatest number of accidents occurred
(*d*) Kind of weather in which greatest number of accidents occurred
(*e*) Causes reported by highway officers

3. Suppose there is a particular job that you wish to secure when you graduate from high school. Make a list of the kinds of data about yourself which you think you should furnish your prospective employer to prove to him that you are the person he should employ. Be sure to include only relevant data.

4. Henry Forbes wanted to find out how many automobiles were junked last year. Are any of the following data relevant for Henry's purpose? Explain.

(*a*) The number of licenses for new automobiles issued last year.
(*b*) The total number of automobile licenses issued last year.
(*c*) The number of automobiles manufactured last year.
(*d*) The number of cars manufactured over a period of six years.
(*e*) The average age of automobiles still in use.
(*f*) The total revenue from automobile licenses.

5. Here is a list of several types of data. Consider each type carefully and indicate one or more questions for which it could be considered relevant data.

- (*a*) Value of property lost annually by fire in the United States for the past twenty years
- (*b*) Total tonnage of new ships built in the United States in each of the past twenty years
- (*c*) Annual production of airplanes in the United States over the past ten years
- (*d*) Percentage of the population in various age groups in the United States for the five preceding census reports

6. The United States Department of Agriculture published a study of the body measurements of American boys and girls. The purpose was to discover a better basis than age for determining the sizes of children's clothes. In all, thirty-six body measurements were made for each of 147,000 boys and girls. Among these measures were the following: height of waist, weight, total height, crotch height, chest width, waist girth, length of arm, length of shoulder, and neck girth. Indicate the kind of garment or part of a garment for which each of these measurements may be considered relevant as a basis for sizing. You may compare the relevance of any measurement for its particular purpose with the relevance of the circumference of the head as a basis for sizing hats.

7. If you were seeking answers to the following questions, what data would you consider relevant in each case?

- (*a*) What preparation in mathematics is needed in various occupations, such as nursing, advertising, piloting airplanes, medicine, repairing automobiles?
- (*b*) What is the average annual cost of clothes for a college man or a college woman?
- (*c*) Is the experience gained on the staff of a high school paper of great value or little value to students who later pursue journalism as a career?
- (*d*) Is cold serum effective in preventing common colds?
- (*e*) Are persons who take vitamin concentrates more healthy than those who do not?

Philip Gendreau

PROBLEM III

In What Ways May Data Be Arranged and Presented to Show Their Meaning?

Mr. Joe Prentice comes home from work tired, turns on the radio, and sits down to relax. There is a good chance that within a short time he will hear some broadcaster saying, "Statistics have proved . . .," or "Figures show that of all the people who use . . ." If he looks at the newspaper, his eye may be caught by a graph and a table on the latest cost of living data; or he may read that "It is estimated that production next month will exceed the previous peak month by . . ."

Mr. Prentice has probably never given a thought to the fact that much work and planning went into the arrangement and presentation of the statistical data in the news, in order that he might quickly and easily know what they mean. If he had been presented with the data as they were originally collected, he probably would not have paid any attention to these reports. Because the facts were clearly presented, so that the person with average interests could understand them readily, Mr. Prentice both listened and read with interest.

The meaning of statistical data, and also their usefulness and their interest for most persons, usually depend upon the way in which the data are arranged and presented. The experts in statistics, the statisticians, have worked out a number of special methods of handling all sorts of data in order to put them into understandable form. But there are a few general methods and devices, such as tables, graphs, and averages, which are regularly used to bring out the meaning of data.

Tables aid in giving meaning to data.

The students in the two-o'clock section of Miss Boardman's typing class have just taken a 10-minute speed test. Their scores, arranged alphabetically according to names, are given in the following table:[1]

SCORES ON TYPING TEST: TWO-O'CLOCK SECTION

Albright, Irene	40	Lanterman, Rose	42
Allen, Joe	20	Lomenthal, Joseph	43
Barker, John	40	McMurray, Freda	39
Brownell, Rose	35	Mantel, Fred	35
Carter, Ann	45	Marston, Kate	44
Crow, Donald	41	Meuden, Samuel	40
Dawes, Joyce	42	Meyer, Pauline	30
Ellers, Isabel	45	Owen, Clarence	43
Fiske, George	38	Randall, Charles	39
Ford, Bernard	36	Reder, Agnes	25
Hare, Davis	43	Smith, Vincent	36
Herrick, Ralph	29	Wright, Frances	42
Hogan, Franklin	44	Wright, Marjorie	30
Johnson, Laura	35		

When the teacher, Miss Boardman, announced these scores, some of the students asked how the class compared with the ten-o'clock section. Miss Boardman replied that she would have to let them know later.

What is the highest score given in the table for the two-o'clock section? What is the lowest score? Is there any score that appears more frequently than any other?

Did you find it a bit inconvenient to answer the questions above by using the alphabetical table? Miss Boardman did, too. So she arranged the scores (the data) in a different kind of table. Instead of keeping the scores according to the alphabetical order of the names, she arranged them according to size, beginning with the highest score. That kind of table is called a *rank-order table.*

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[1] TO THE TEACHER. In teaching the early lessons in statistical techniques, great care must be exercised in selecting the data to be used. The data should of course be of genuine interest to the students, but should probably not involve a distracting social or economic problem. It is highly desirable that the students' focus of attention be on the new procedures during the first few lessons. From this point of view the data employed here have proved highly satisfactory. The test scores of Miss Boardman's typing class (see also Ex. 1, page 24) form the basis for problems on subsequent pages bearing upon comparison of the two sections of the class.

In building the rank-order table, what score should Miss Boardman place first? second? third?

The first five entries in the table in which the scores are arranged in rank order are given below. Complete the table. You will have later use for this table.

Carter, Ann	45
Ellers, Isabel	45
Hogan, Franklin	44
Marston, Kate	44
Hare, Davis	43

The uses to be made of data largely determine the arrangement of the table. Besides alphabetical and rank-order arrangements, data are often arranged chronologically; for example, the production of airplanes by years. It will be interesting to look through a book of statistics, such as *The World Almanac,* to find examples of various arrangements of data in tables. You may wish to discuss in class the probable reasons for and value of the arrangements in some of the tables.

Questions to Discuss and Problems to Solve

1. The scores of the ten-o'clock section of Miss Boardman's typing class are given in the following alphabetical table. Arrange these scores in a rank-order table. You will have later use for this table.

SCORES ON TYPING TEST: TEN O'CLOCK SECTION

Bartell, William	44
Barwick, Hazel	40
Brown, Earl	43
Bryant, Ted	41
Buinell, Lloyd	32
Carter, Jean	47
Dewey, Charles	36
Ebers, Joan	38
Erby, Willis	45
Fitzpatrick, Bert	33
Hafnor, Henry	39
Hafnor, Margaret	36
Hall, Helen	29
Irwin, Ruth	35
Isaacs, Joseph	42
Keene, Roger	38
Lowe, Barbara	34
McPherson, Mary	30
Marcot, Leslie	42
Morton, Larry	31
Norton, Shirley	30
Pardon, Phyllis	32
Parker, Sue	40
Redman, Dick	40
Reynolds, Bob	39
Rice, Marilyn	21
Royston, Bob	30

2. What was the highest score in the ten-o'clock section of the typing class? the lowest? Was there any one score that appeared more frequently than any other?

3. The difference between the highest score and the lowest score is called the *range* (of scores). What was the range of scores for the ten-o'clock section of Miss Boardman's typing class? What was the range for the two-o'clock section?

4. Do you agree that different kinds of tables of data serve different purposes? You have just used two kinds of statistical tables: one arranged the data in alphabetical order of students; the other arranged the data in order of size of score. For what purposes do you think each of these arrangements would be helpful?

5. Below are the official temperatures released by the United States Weather Bureau for a day in August. Arrange these data in a table to show the order of the differences between highest and lowest temperatures during the day; that is, in the order of the ranges of temperature.

The first item in your table will be: Denver 30 (that is, $96 - 66 = 30$). What questions does your table answer at a glance?

HIGH AND LOW TEMPERATURES FOR A DAY IN AUGUST

CITY	HIGH	LOW	CITY	HIGH	LOW
Albany.......	70	63	Duluth.......	70	57
Atlanta.......	92	68	Kansas City...	100	80
Bismarck.....	81	57	Miami........	90	79
Boston.......	74	60	New Orleans...	95	77
Brownsville...	94	77	New York.....	73	68
Buffalo.......	79	61	Oklahoma City	98	74
Chicago......	92	70	Philadelphia...	82	71
Cincinnati....	90	72	Pittsburgh....	86	67
Denver.......	96	66	St. Louis......	98	79
Detroit.......	88	64	Washington...	89	72

6. The table above lists the cities alphabetically for convenience in reference. The data could be arranged geographically by grouping all the northeastern cities, all the southeastern, north central, etc. For what use might a geographical arrangement be better than an alphabetical table?

7. Now arrange the data of Ex. 5 in a table to show the ranks of the cities in high and low temperatures, starting with the highest temperature in each case. Your table might start like this:

CITY	RANK FOR HIGH TEMPERATURE	RANK FOR LOW TEMPERATURE
Kansas City	1	1
Oklahoma City	2.5	6
St. Louis	2.5	2.5
Denver	4	14

Notice that Oklahoma City and St. Louis are given the same rank (2.5) for high temperature, halfway between the second and third ranks, because they both have the same temperature, 98°. A similar procedure is followed in obtaining the ranks of other cities with equal temperatures.

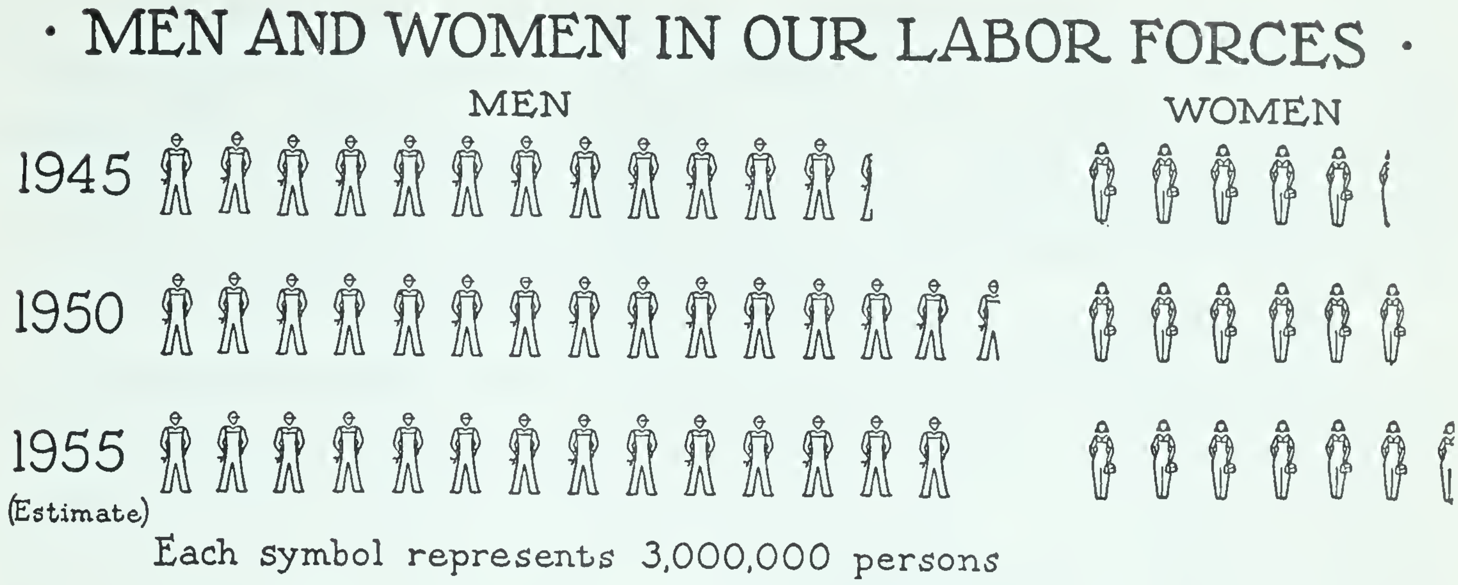
8. Here is a table that gives the ages, heights, weights, and foot sizes of ten well-known movie actresses who shall remain anonymous.

ACTRESS	AGE	HEIGHT	WEIGHT	FOOT SIZE
A	21	5′ 3½″	110	5½ B
B	21	5′ 7″	128	6½ B
C	22	5′ 5½″	115	6½ AA
D	22	5′ 2″	98	5½ AA
E	23	5′ 6″	117	6 A
F	23	5′ 5¾″	114	6 A
G	26	5′ 6″	118	6½ A
H	27	5′ 3″	103	5 A
I	27	5′ 6″	120	6 C
J	31	5′ 6½″	120	6½ AA

(*a*) The order of the tabulation is according to age. Does the table show any relation between age and any of the other data? That is, as age increases is there also a tendency for height, weight, or foot size to increase (or decrease)?

(*b*) How would you arrange the data above in a table to show whether or not there is any relation between heights and weights? Make the height-weight table.

(*c*) Tabulate the data to show relation between weights and foot sizes.



Data from Bureau of Census, U. S. Department of Commerce

This is a type of graph you may expect to see in your daily reading. It makes several facts clear and vivid.

Data may be presented in graphs to make meanings clear.

You have seen many statistical graphs in books and magazines, and in your earlier studies you have learned how to read and to make various graphs.[1] Graphs appeal to the eye, and they have certain obvious advantages in presenting statistical data. In the first place, they may be made to present data with vividness, focusing attention upon particular facts or meanings. This quality of graphs causes them to be used widely in newspapers and magazines. A second way in which graphs are useful is that from them trends or relationships can be seen at a glance.

While graphs make meanings vivid and clarify relationships, we must keep in mind that they represent data only approximately. However, for many purposes approximate representation of data is adequate, and graphs can be made sufficiently accurate for such uses.

There are three main types of graphs, although each type has its variations — the bar graph, the line graph, and the circle graph or rectangle graph. Sometimes picture graphs, or pictograms, are listed as a separate type of graph, but pictures are now used with all types of graphs. Any picture graph may be classified as one of the three basic kinds and so need not be called a separate type.

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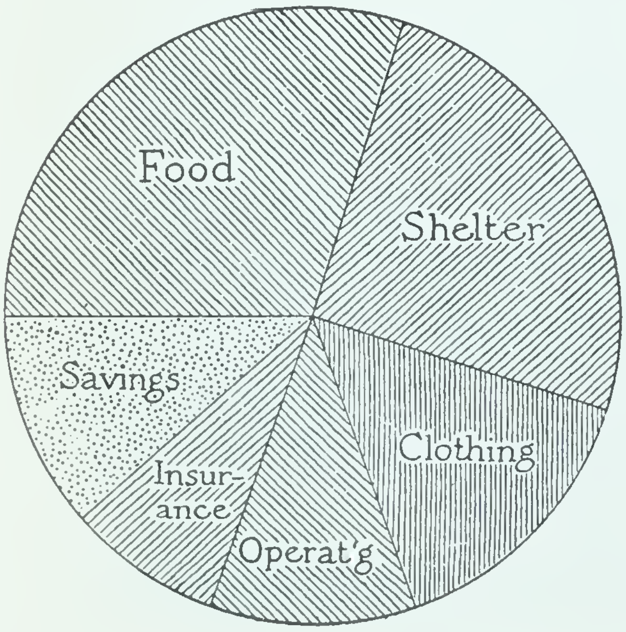
[1] To the Teacher. Any students who wish to review basic work on graphs may refer to the unit of *Basic Ideas of Mathematics* (World Book Company).

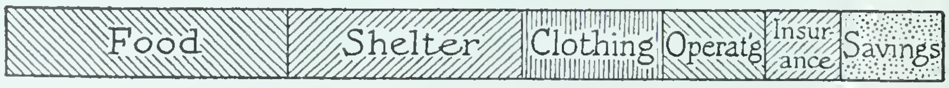
When an investigator wishes to use graphs in a statistical study, he must first decide which type of graph to use. The wrong kind of graph may obscure meanings that are present in the data. Sometimes several graphs are needed in order to show different facts. Here are the guides to be followed in deciding which type of graph to use:

1. Use a bar graph whenever the data are discrete; that is, whenever each item of the data stands by itself. For example, income-tax receipts by years constitute discrete data, because each year's receipts stand by themselves. The total receipts for any year do not change within the year, nor do they gradually change into the next year's total receipts. On pages 31 and 32 are examples of bar graphs.

2. Use a line graph whenever the data are continuous. For example, the temperatures at different hours of the day constitute continuous data, because temperature continues to change between the times of observation. Also a graph of business activity over a period of years should be a line graph, because the data do not represent sudden changes from year to year, but a continuous change. Graphs of growth would likewise be line graphs, since growth is a continuous process. On pages 33, 34, and 35 are examples of line graphs.

3. Use a circle graph or a rectangle graph whenever parts of a whole are to be represented. For example, in picturing how each dollar of the taxpayers' money is spent by the government, we should use a circle or a rectangle graph. Likewise the amounts for the various divisions of a family budget would be presented in a circle graph. (A rectangle graph is sometimes referred to as a single-bar graph.) Below are examples of the circle and rectangle graphs.





These two graphs picture the same family budget. Which style do you prefer? In the circle graph or in the rectangle graph the entire area represents the whole, or 100 per cent. Figures for the fractional parts or per cents are sometimes written on the graph for the various divisions, when they may be useful to the reader.

Questions to Discuss and Problems to Solve

A Federal Census is taken every ten years. Below are some data obtained from the Federal Census of 1950. Study them and decide what kind of graph you would use to bring out the meaning of the data in each table most clearly and vividly.

1. Per cent of persons 5 to 24 years of age attending school in the United States by age groups:

AGE GROUPS	PER CENT ATTENDING SCHOOL
5–13	81.4
14–17	84.4
18–24	18.6

2. Per cent of persons in the United States by race and nativity:

SUBJECT	PER CENT
Native white.......	83.0
Foreign-born white.	6.7
Negro.............	9.9
Other.............	0.4

3. Distribution of employed workers by per cents in occupational groups for the United States:

OCCUPATIONAL GROUP	PER CENT OF TOTAL	
	Men	Women
Private wage and salary worker..........	68.0	77.6
Government workers.....................	8.8	13.0
Self-employed workers..................	21.5	5.8
Unpaid family workers..................	1.6	3.5
	99.9	99.9

4. From data obtained at various times, the Census Bureau makes estimates of future changes in population before the next census is taken. Estimated population changes in the United States by years from 1951–1960 are given in the following table. Present these data in a suitable graph.

YEARS	POPULATION IN THOUSANDS	YEARS	POPULATION IN THOUSANDS
1951	153,741	1956	162,959
1952	155,920	1957	164,535
1953	157,902	1958	166,055
1954	159,700	1959	167,529
1955	161,311	1960	168,933

5. Below is a sample of a kind of graph that appears frequently in newspapers and magazines. Study it and then answer the following questions:

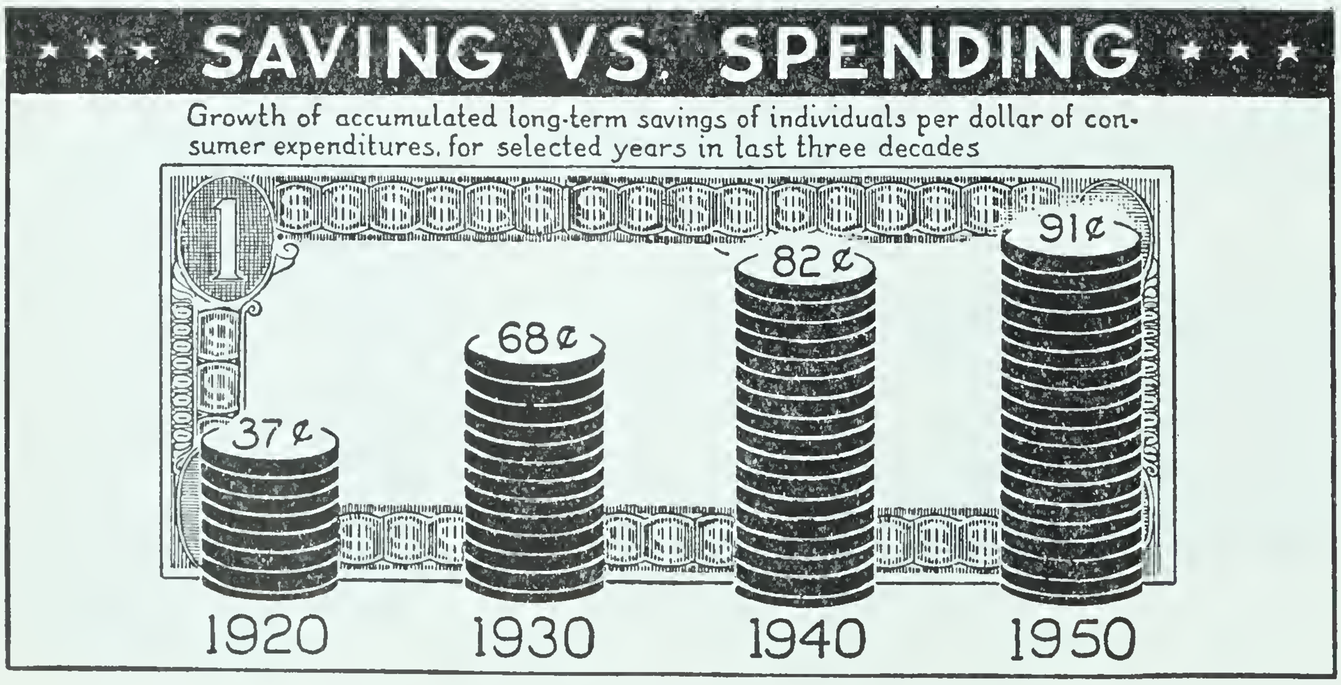
(*a*) This is an example of which of the three basic types of graphs?

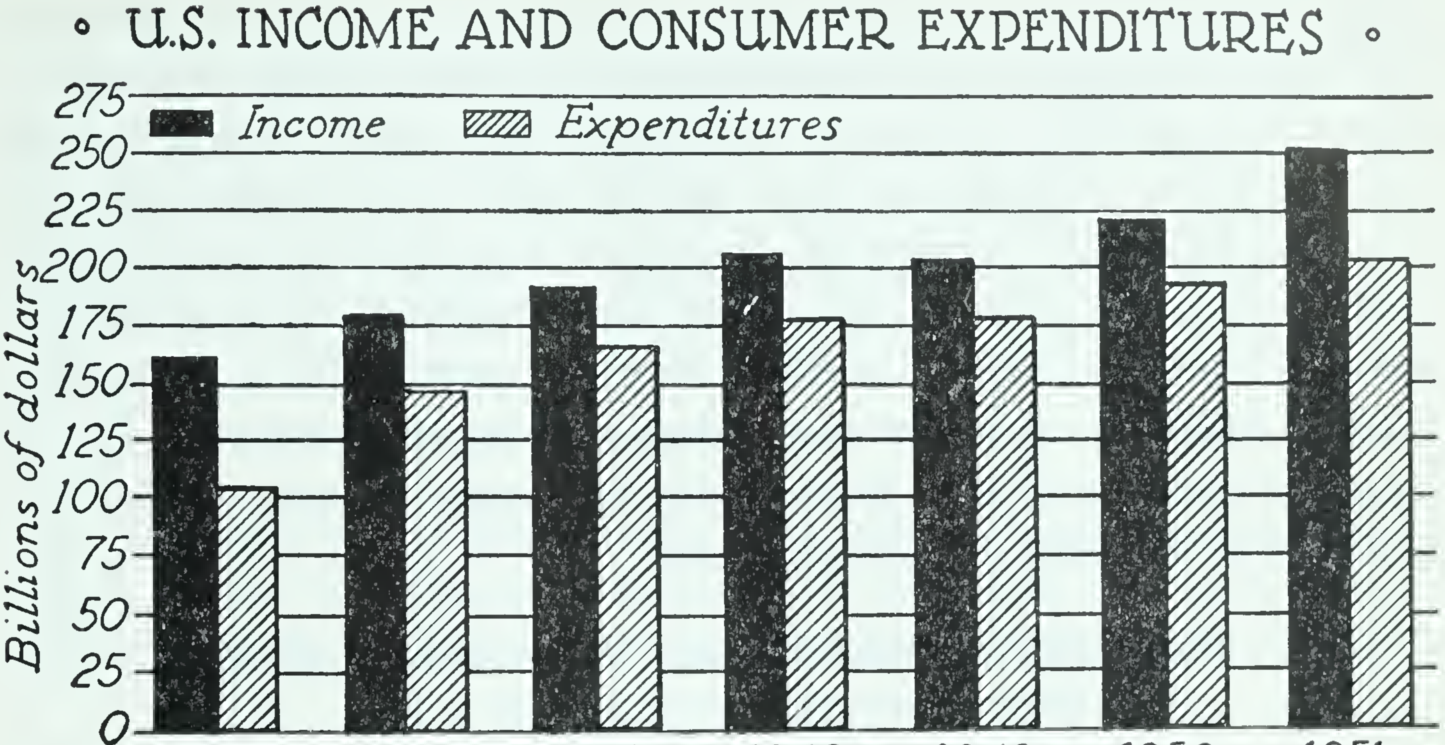
(*b*) Do you think this is the proper kind of graph to use for these data?

(*c*) In what ways does the graph give vividness to the data?

(*d*) How does the graph picture trends clearly?

(*e*) The accumulated savings represented in this graph were $64 billion in 1920 and $174 billion in 1950. Read the graph and then compute the amount spent by consumers in these years.





Data from Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce

6. The graph above is another kind that appears widely in newspapers, magazines, and public reports. Consider the following questions concerning it:

(*a*) This is an example of which of the three basic types of graphs? Is this the proper kind of graph to use for the data represented?

(*b*) Assuming the estimates are correct, for which year is there the greatest difference between income and consumer expenditures? How much is this difference? How does this difference compare with the smallest difference?

(*c*) In which years pictured do you think savings in this country were greatest? In which year were they probably the least?

(*d*) How does the expenditure in 1950 compare with your answer to Ex. 5(*e*)?

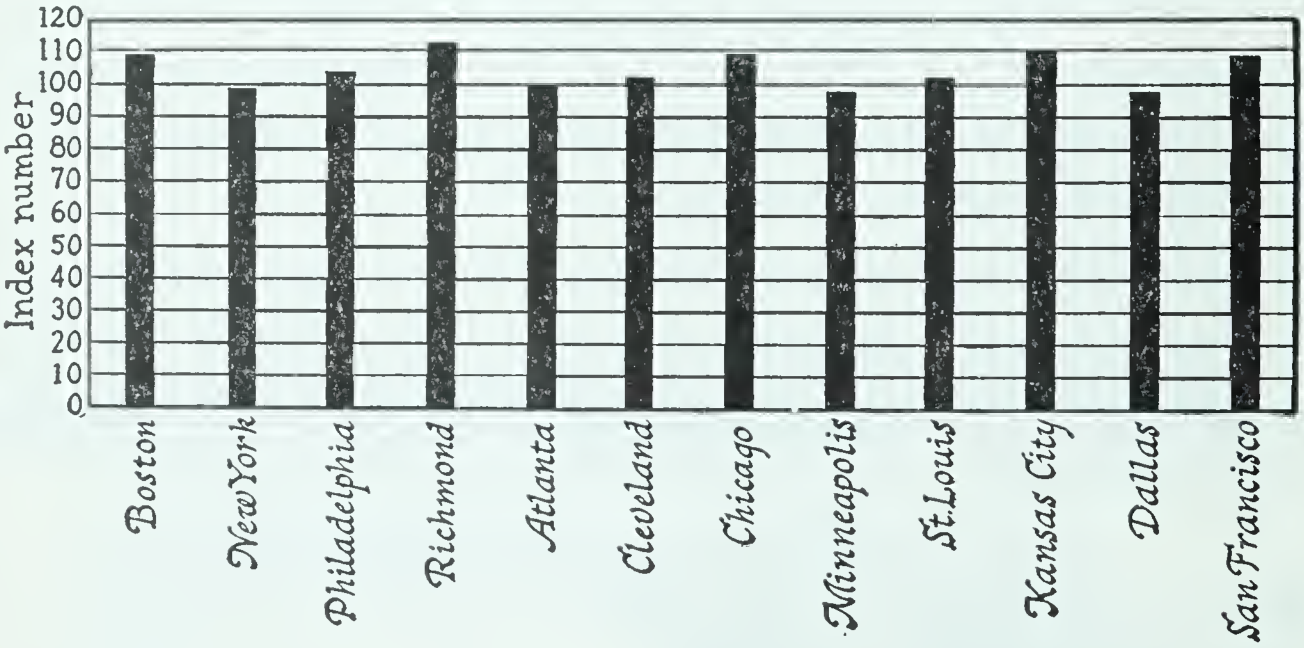
Index numbers may be used to show comparisons.

A frequent use of statistical data is to make comparisons. You have already seen how important it is that data be comparable. However, even comparable data, as first collected, may not give us the basis for making a satisfactory comparison, or the kind of comparison that has greatest meaning.

For example, suppose we wished to compare the relative increase or decrease in department-store sales during a certain week in a number of large cities with the sales in those cities during the same week of the previous year. If cash sales were used in each city, it would be difficult to compare the relative increases and decreases in the individual cities. The sales in New York might fall off while the sales in Atlanta increased, but actual totals would still show larger sales in New York than in Atlanta. A better comparison can be made between the increase or decrease of sales in each city by means of *index numbers,* as is shown in the table and graph below.

DEPARTMENT-STORE SALES: WEEK AUGUST 17–22
(Base: Same week previous year = 100)

CITY	INDEX NO.	CITY	INDEX NO.
Boston	109	Chicago	109
New York	99	Minneapolis	98
Philadelphia	104	St. Louis	102
Richmond	112	Kansas City	110
Atlanta	100	Dallas	97
Cleveland	102	San Francisco	109



Index means indicator, and an index number is an indicator number. Usually an index number of 100, called the *base,* is assigned to represent a particular condition. Then, the index numbers for all other conditions are ratios or per cents of the assigned base.[1]

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[1] TO THE TEACHER. It is suggested that this is a desirable time to check up on the handling of per cents. See pages 393 to 402.

For Boston the index number of 109 in the table and graph means that the amount of sales for the week was 109 per cent of the sales for the same week in the previous year. In other words, the sales were 9 per cent above the previous year.

Which city had the same amount of sales as a year ago?

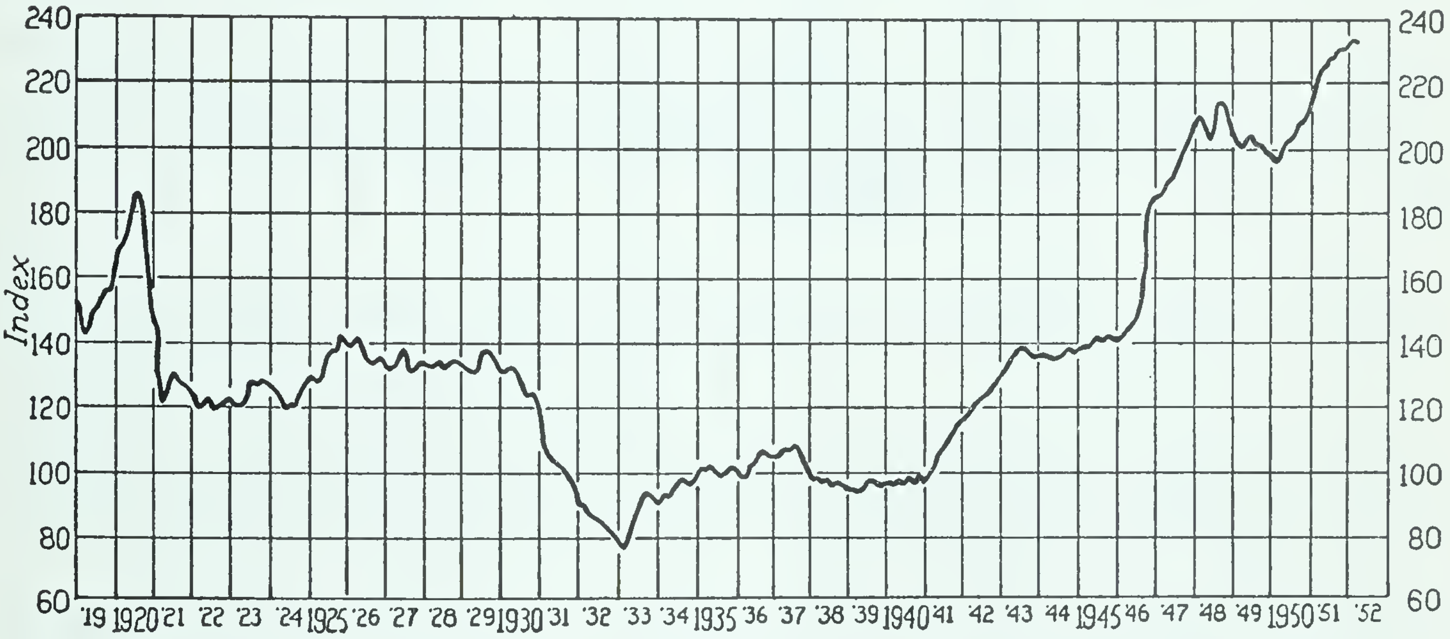
Which cities had smaller sales?

In general, how do the sales for the week compare with sales during the same week of the previous year?

1. The data for the graph below were collected and prepared by the United States Department of Labor. Do you know why such a graph is useful? After examining the graph, answer the questions beneath it.

Retail Cost of All Foods

(Average for 51 large cities. Base: Average of 1935–39 = 100)



Data from Bureau of Labor Statistics, U. S. Department of Labor

(*a*) What is the base for the index numbers in the above graph?

(*b*) A year and one half after World War I in November, 1918, a peak in food prices was reached. Did this condition repeat itself after the end of World War II in 1945? Explain.

(*c*) If a family's average food bill was $16 weekly between 1935 and 1939, what would it have been early in 1933, if price changes alone are considered? What would it have been near the end of 1930? at the end of 1951?

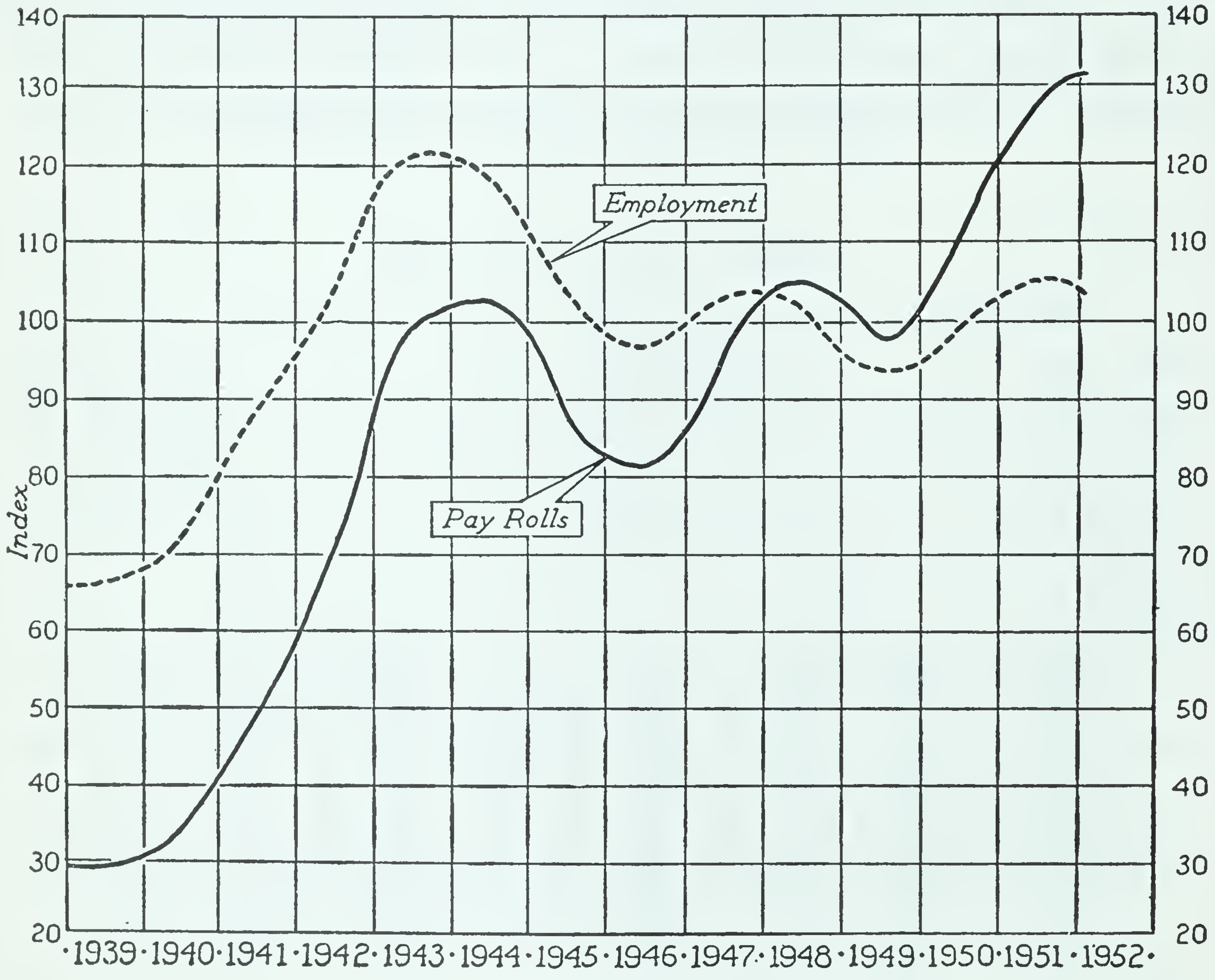
(Continued on next page)

(*d*) How does the price rise for the post-war years 1919–1920 compare with that for the post-war years 1946–1947?

2. The following double-line graph gives two sets of related data. Do you think of any advantages in showing the data in this way on one graph? What is the base for the index numbers in this graph?

NUMBER OF EMPLOYEES AND AMOUNT OF PAYROLLS

(All manufacturing industries. Base: 1947–49 average = 100)



Data from Bureau of Labor Statistics, U. S. Department of Labor

(*a*) Can you tell from the above graph how many persons were employed at any one time? Can you tell the actual amount of pay rolls?

(*b*) What kinds of comparisons can you make from this graph?

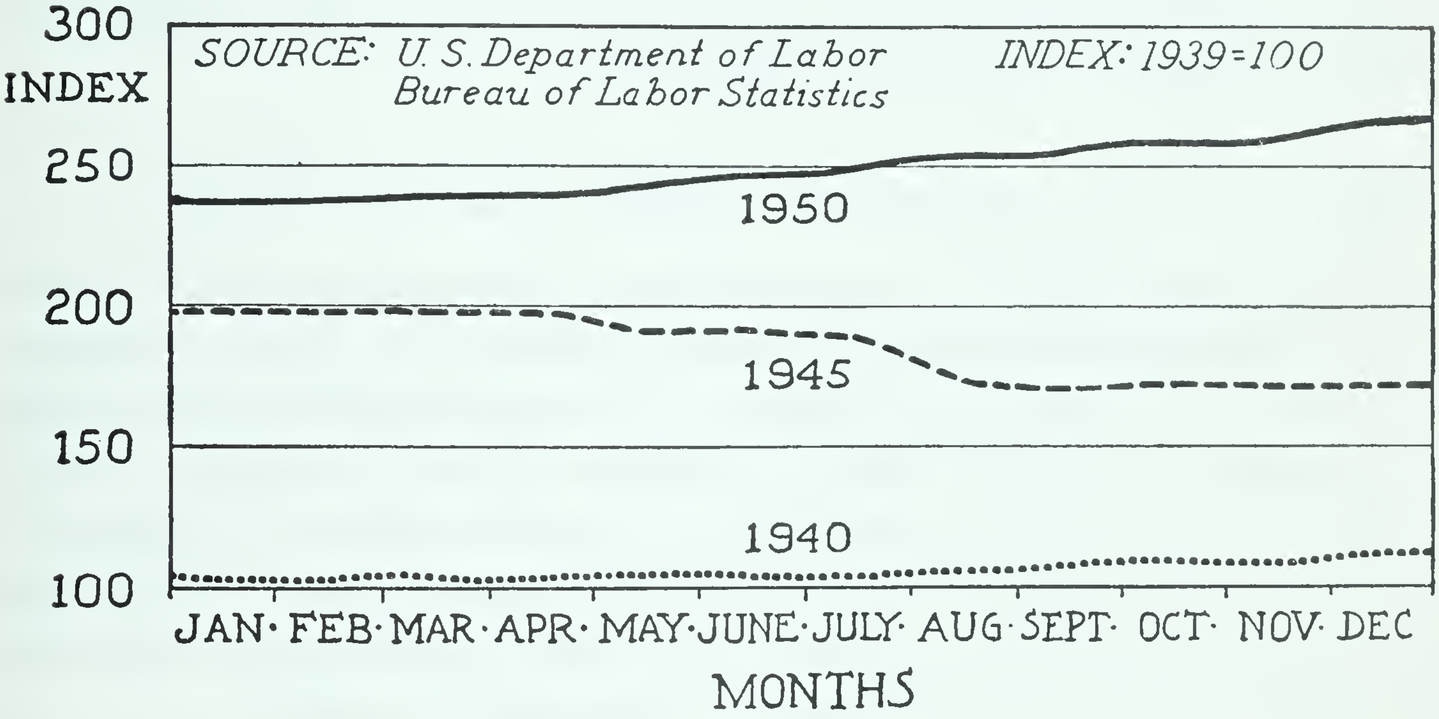
(*c*) What are the index numbers for the lowest points reached by the two lines of the graph? What general business and economic conditions prevailed in this country during that general period? Does the graph indicate these conditions?

(*d*) Where are the highest points reached by the two lines? What conditions prevailed at that time?

(*e*) How did the *average* wages in 1940 and 1950 compare?

(*f*) Approximately how many times as many persons were employed on the average in 1951 as in 1940?

AVERAGE WEEKLY EARNINGS IN MANUFACTURING INDUSTRIES



3. Above is a line graph of an important trend in weekly earnings.

(*a*) What is the index base?

(*b*) When did the average weekly earnings first reach about $1\frac{3}{4}$ times the average for 1939? about $2\frac{1}{2}$ times the 1939 average?

(*c*) The average weekly earnings of workers represented in this graph were actually \$23.86 in 1939. Now read the graph and estimate the actual average earnings for the beginning of each year pictured. (HINT. 103% of \$23.86 = _?_.)

4. Farms are getting larger in the United States. In 1910 the average size of farms was 138 acres; the 1920 average was 148 acres; the 1930 average was 157 acres; and the 1940 average was 174 acres; the 1950 estimated average was 198 acres. Take the 1910 average of 138 as the 100 per cent base, and compute the index number for the average size of farms for each of the other four years. (HINT. 148 is what per cent of 138?)

After computing the index numbers, present the data in a bar graph.

5. The total debt of the United States government to the nearest half-billion dollars for the years 1938–1952 is given in this table.

1938	37.0	1943	137.0	1948	252.5
1939	40.5	1944	201.0	1949	253.0
1940	43.0	1945	259.0	1950	257.0
1941	49.0	1946	269.5	1951	259.5
1942	72.5	1947	258.5	1952	260.0

Use 1938 as the base year, or 100 per cent. Then compute the index numbers for each of the other years.

Data may be grouped to make meanings clear.

The original data for many statistical studies will consist of a great many numbers, or measures, which may scatter over a fairly wide range of values. For example, the scores of the two-o'clock section on the typewriting test given on page 23 are data of this kind; there we have twenty-seven numbers ranging from 45 to 20, with some of them repeated. If we collected data on the height and weight of high school seniors, we should have a great many scattering measures or numbers for all the students included in our representative sample.

Whenever we collect scattering data, we usually wish to find the answers to such questions as these: Which measure, or score, occurs most frequently? Which occurs the least frequently? Are most of the measures near the average, or are they scattered all along from the highest to the lowest?

In order to answer these questions easily and bring out important meanings, the data must be handled and arranged in special ways. We have already seen that making a rank-order table for certain data helps us (pages 23–24). There is, however, another kind of table that is more useful and timesaving for handling quantities of scattering data. It is called a *frequency table.* The following situations show how frequency tables are made and used.

(1) Here are the number of tickets for the senior play that were sold by twenty-five students. As an incentive to increase the sale of tickets, a free ticket was given to each student who sold ten tickets or more.

10 12 8 10 10 9 6 5 11 11 9 8 9
10 9 5 4 10 15 13 13 7 12 10 10

When we examine these data we see that 1 student sold 15 tickets, 0 students sold 14 tickets, 2 students sold 13 tickets, and so on to the smallest number, 4, which was sold by 1 student. We can show this by making a frequency table, like the one at the right.

Frequency Table of Tickets Sold for Senior Play

Number of Tickets Sold	Frequency
15	1
14	0
13	2
12	2
11	2
10	7
9	4
8	2
7	1
6	1
5	2
4	1

A frequency table gets its name because it shows at a glance how frequently each measure or number occurs in the whole group of data. In this problem the "measures" are the numbers of tickets sold. Notice that the first column of the table lists these numbers in order from highest to lowest. The second column, headed "Frequency," shows how many students sold each number of tickets; it shows the *frequency* with which each measure occurred. A frequency table also shows how the measures are distributed; it shows their *distribution,* and is sometimes called a *frequency distribution.*

Use the table to help answer the following questions on the sale of tickets:

What was the range of number of tickets sold; that is, the difference between highest and lowest number sold? What one number of tickets was sold by the greatest number of students? Is it near the middle of the distribution? Would you say it is about the average number sold by a student? Are the highest frequencies near the middle of the range?

How many students received free tickets for selling ten or more? How many did not? Did many students sell more than enough tickets to entitle them to a free one?

(2) For most investigations the range of the data is usually greater than in the problem on the sale of tickets. Moreover, the frequency of each measure, or score, may not be more than 1 or 2. Consider, for example, the scores in the table at the right made on an arithmetic test by a nine-o'clock section in consumer mathematics. The scores are arranged in rank order.

RANK-ORDER TABLE OF SCORES ON ARITHMETIC TEST: NINE-O'CLOCK SECTION

98	70	54
91	69	54
89	65	53
85	64	52
83	63	51
81	62	50
77	61	49
74	59	44
74	58	36

In this case a table like the one you have just used (giving a frequency for each measure) would not add much meaning to the data. It would look almost like the rank-order table. Do you see why?

We can, however, make a different kind of frequency table in which the scores are taken in groups; for example, all scores from 30 to 39 are counted together, all from 40 to 49, etc. We show the frequency for each group of scores. Such a table is called a *grouped frequency table.* (It is also called a *grouped distribution.*)

At the right is a grouped frequency table of the above data, showing the results of the nine-o'clock section on the arithmetic test. The scores have been counted by groups. Each group of scores is called a *class interval.* The table is read as follows: "There are 2 students who made scores that fall in the 90's; 4 scores in the 80's; 4 in the 70's, etc."

SCORES ON ARITHMETIC TEST: NINE-O'CLOCK SECTION

CLASS INTERVAL	FREQUENCY
90 through 99	2
80 through 89	4
70 through 79	4
60 through 69	6
50 through 59	8
40 through 49	2
30 through 39	1

What is the size of the class interval used in the above table? Once a class interval for a particular grouped frequency table has been decided on, that interval must be used throughout the table. Thus, a grouped frequency table could not have a class interval of 10 in one part and a class interval of 5 in another part. The greatest number of scores fall in the interval _?_ to _?_. How many students made scores 70 and above? How many students made scores 59 and below?

(3) Here is a grouped frequency table of scores made by a three-o'clock consumer mathematics section on the arithmetic test. This table has the same class interval of 10 which was used in the table for the nine-o'clock section. We can now use the two grouped frequency tables to compare the two mathematics sections.

Which section had the greater number of students making high scores? Which section had the greater number of students making scores near the middle of the range? If 70 is the passing score, how many failed in each section?

SCORES ON ARITHMETIC TEST: THREE-O'CLOCK SECTION

CLASS INTERVAL	FREQUENCY
90 through 99	5
80 through 89	7
70 through 79	5
60 through 69	3
50 through 59	3
40 through 49	1
30 through 39	3

(4) We can condense the preceding tables further by increasing the size of the class interval. If we use 20 as the class interval, it is desirable to go down to a score of 20 to include the low scores in the 30's. When this is done, the two tables become:

NINE-O'CLOCK SECTION

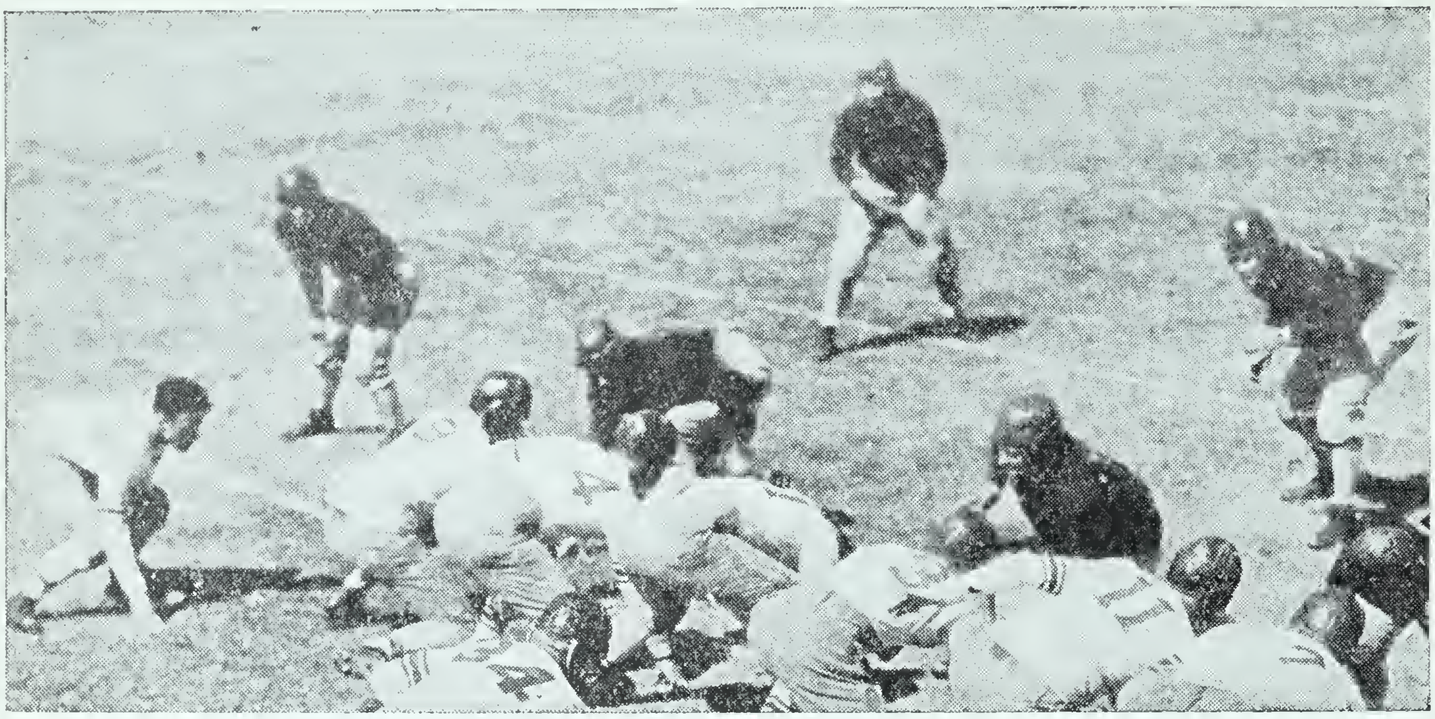
CLASS INTERVAL	FREQUENCY
80 through 99	6
60 through 79	10
40 through 59	10
20 through 39	1

THREE-O'CLOCK SECTION

CLASS INTERVAL	FREQUENCY
80 through 99	12
60 through 79	8
40 through 59	4
20 through 39	3

It is evident that if the arithmetic test had been a contest between the twelve best students in each of the two classes, the team from the three-o'clock section would easily have defeated the team from the nine-o'clock section. Does the use of the larger class interval make anything else clearer than when the interval of 10 is used?

In preparing a grouped frequency table, the size of the class interval should be large enough so that there are few or no intervals with zero frequencies. However, in the process of grouping we lose the exact value of the individual items; in the condensed table for the nine-o'clock section we do not know whether any or all of the 6 scores that fall in the first interval are near 80, near 99, or exactly what the values are. Therefore, it is best not to make the class interval too large.



G. A. Douglas from Gendreau

Questions to Discuss and Problems to Solve

1. Here are the weights of the players on two professional football teams. The weights are arranged in rank order. Arrange these weights in grouped frequency tables, using 10 as the class interval: thus, 180–189, 190–199, etc.

CHICAGO CARDINALS			NEW YORK GIANTS		
235	210	195	245	215	195
235	210	190	240	215	195
235	205	190	230	215	195
225	205	190	230	210	195
225	205	185	225	207	190
225	205	185	225	205	190
220	205	185	223	205	190
220	200	185	220	203	186
220	200	180	220	202	185
215	195	180	218	198	185
210	195	180	218	196	185
210	195		218	195	183
					180

2. How do the teams compare in number of players above 229 pounds (that is, 230 pounds or more)? below 190 pounds (that is, 189 or less)?

3. Condense the tables obtained for Ex. 1 by using 20 as the class interval. How do these tables enable you to answer more readily the question as to how many players weigh 200 pounds or more?

4. Obtain the heights and weights of the students in your class and arrange them in grouped frequency tables.

5. Would frequency tables help you compare the test scores of the two sections of Miss Boardman's typing class, given in the tables on pages 23 and 24? Would you use grouped frequency tables? What class interval would be a good one?

6. The frequency tables just discussed were all made from measures listed in rank order. A grouped frequency table can be made without having the measures listed in rank order. This usually saves time, especially if there are a large number of measures. This can be done by writing down in rank order the class intervals decided upon for the frequency table and then making a tally mark (short vertical line) for each measure that occurs in that interval. Make grouped frequency tables of test scores for the two sections of Miss Boardman's typing class, given on pages 23 and 24, without first arranging the scores in rank order. (Use a class interval of 3.)

CLASS INTERVAL	FREQUENCY
41–45	𝍷𝍷𝍷𝍷
36–40	𝍸
31–35	𝍷𝍷
26–30	𝍷𝍷𝍷
Total	

General form used in tabulating data for a frequency table, as suggested in Ex. 6.

7. Find out from the students in your school, or your class, who work after school hours, the weekly amount each one earns. Arrange these data in a grouped frequency table.

8. Usually schools are required to report an *age-grade distribution* for the students enrolled. This is a two-way frequency table in which each frequency is for both an age and a grade. Here is a sample of such a table.

AGE-GRADE DISTRIBUTION

	AGE→	14	15	16	17	18	19	20	TOTALS
Grade	10	𝍷𝍷𝍷	𝍸 𝍷	𝍸 𝍸 𝍷	𝍸 𝍷𝍷	𝍷𝍷𝍷𝍷	𝍷𝍷𝍷	𝍷	35
	11	𝍷𝍷	𝍷𝍷𝍷𝍷	𝍸 𝍷𝍷	𝍸 𝍷𝍷𝍷𝍷	𝍸	𝍷𝍷𝍷𝍷	𝍷	32
	12		𝍷	𝍷𝍷𝍷𝍷	𝍸 𝍷	𝍸 𝍷𝍷𝍷	𝍸	𝍷𝍷𝍷𝍷	28
	Totals	5	11	22	22	17	12	6	95

Obtain the ages and grades for any group of students in your school and prepare an age-grade distribution. Discuss what your table shows.

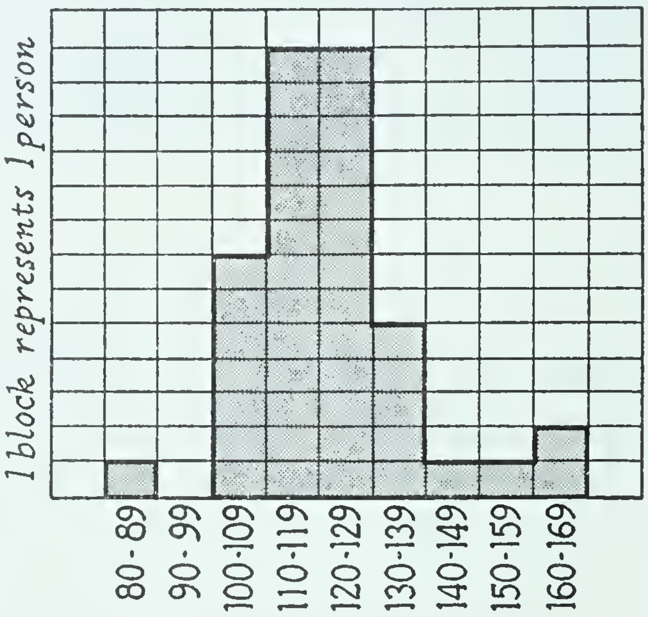
The data of a frequency table may be graphed.

The data contained in a frequency table may be presented in a graph in order to give a more distinct picture of the relationships involved. Such a graph, called a *histogram,* is easy to read and to make.

The weights of the 16-year-old girls in the Waynesboro High School are shown in the grouped frequency table below. Beside the table is the histogram made from the table.

WEIGHTS OF 16-YEAR-OLD GIRLS IN WAYNESBORO HIGH SCHOOL

CLASS INTERVAL	FREQUENCY
160–169	2
150–159	1
140–149	1
130–139	5
120–129	13
110–119	13
100–109	7
90– 99	0
80– 89	1



1. Would you say that this histogram is a kind of vertical bar graph with no spaces or lines between the bars?

2. One "bar" is used for each class interval. How is each bar designated? The arrangement of bars provides a horizontal scale. What does each unit of this scale represent?

3. What is represented on the vertical scale of the histogram?

4. Which two intervals have the greatest frequency? Which interval has zero frequency? Does the graph show the relationships more vividly than the table does?

5. What is the total frequency; that is, for how many girls in all were the weights obtained? In finding this answer, will the table or the graph be easier to use?

6. Using the grouped frequency table of the heights of your classmates which you made for Exercise 4 on page 41, prepare a histogram from your table. You may wish to do the same thing for ages of class members or grades on the last test in mathematics.

7. The frequency table at the right was prepared from data obtained in the 1950 census. Prepare a histogram from this table. Arrange the income groups along the horizontal scale. What will the vertical scale represent?

NUMBER OF FAMILIES IN VARIOUS INCOME GROUPS

INCOME GROUP	MILLION FAMILIES
Under $1000	5.4
$1000–1999	5.6
2000–2999	6.8
3000–3999	7.2
4000–4999	4.4
5000 & above	7.2

8. Turn to the tables on pages 38 and 39 and prepare histograms of these two frequency tables of scores for the two mathematics sections.

9. Here is a frequency table of the monthly rainfall in inches of a Midwestern city for a 36-year period. Prepare a histogram for this table.

RAINFALL IN INCHES	FREQUENCY OF MONTHS
0.00– 0.99	65
1.00– 1.99	120
2.00– 2.99	96
3.00– 3.99	59
4.00– 4.99	33
5.00– 5.99	21
6.00– 6.99	15
7.00– 7.99	11
8.00– 8.99	5
9.00– 9.99	5
10.00–10.99	2
Total	432

10. Miss Mason keeps a record of the books read by each of the 32 students in her English class. The numbers of books read for one session are shown. Prepare a histogram from these data.

9	8	9	6	11	12	6
6	6	7	9	8	11	8
11	9	6	10	9	10	
15	8	10	8	6	8	
12	10	11	12	10	9	

11. Obtain data on some problems of interest to you, arrange them in a grouped frequency table, and prepare a histogram.

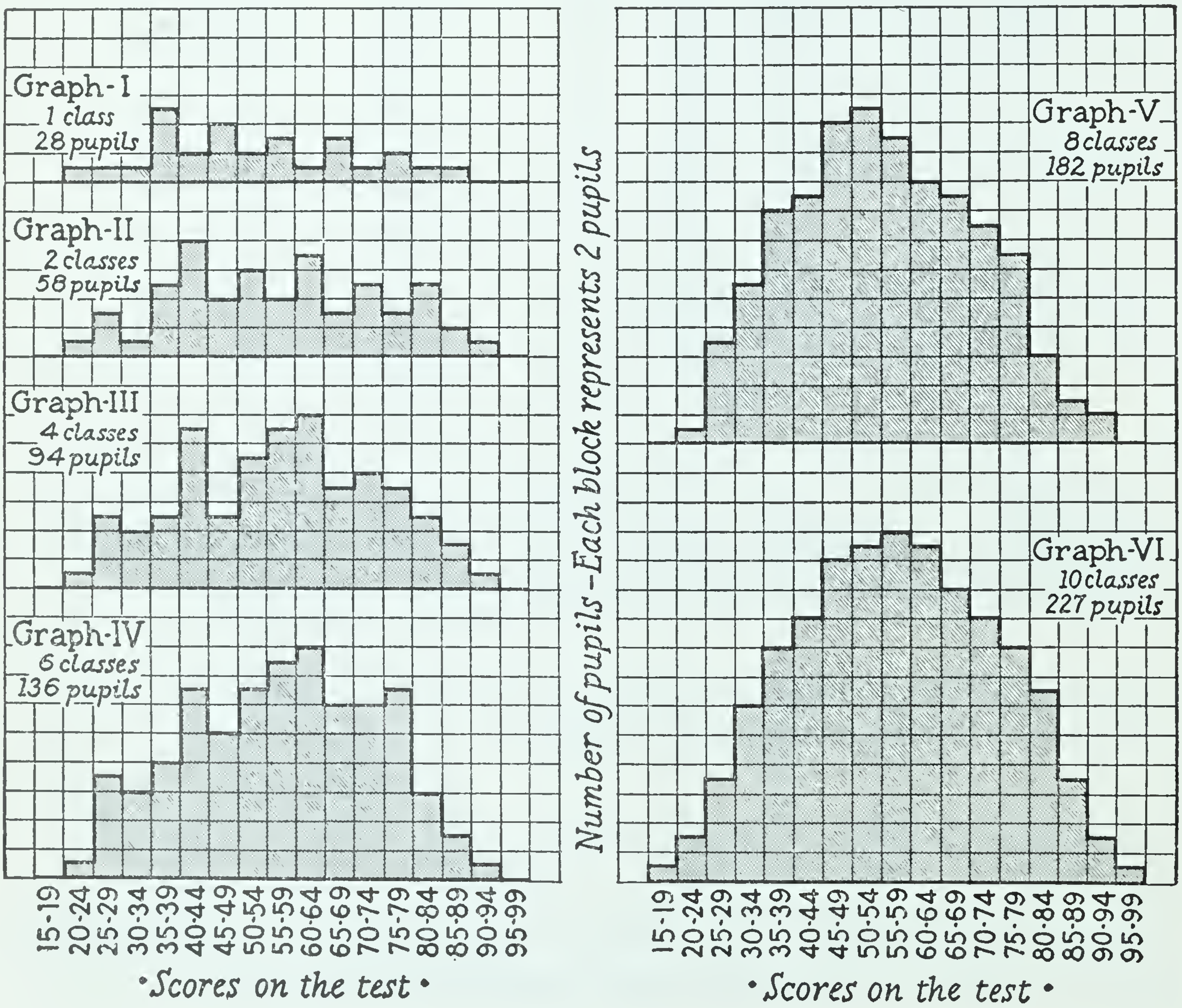
Graphs of grouped data enable us to discover a fundamental law of nature.

Below are the graphs of six frequency tables of scores made by several classes on a computation test. They show how the scores are distributed by groups, from low to high.

Graph I pictures the distribution of scores in one class of 28 students. Graph II includes the students of Graph I and 30 more students from a second class. The students of two more classes are added to Graph II to give Graph III; two more to Graph III to give Graph IV; two more to Graph IV to give Graph V; and two more to Graph V to give Graph VI, which is for 227 students from ten classes.

Observe carefully how the histograms change in outline from Graphs I to VI, as the number of scores, or measures, increases. Do you notice how the outline tends to grow high in the middle and to taper off toward

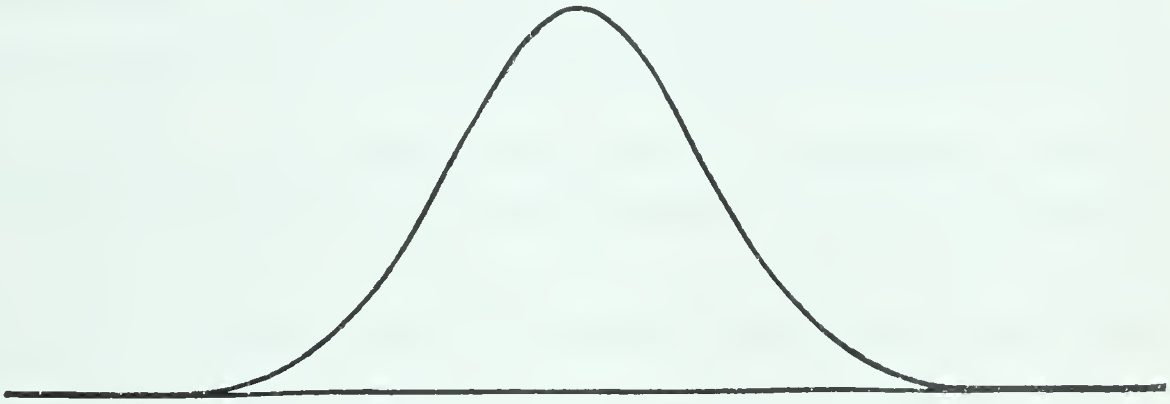
SCORES OF SEVERAL CLASSES ON A COMPUTATION TEST



the ends? If we continued to increase the number of scores represented, the tendency of the histogram to become like a bell-shaped curve is more and more apparent.

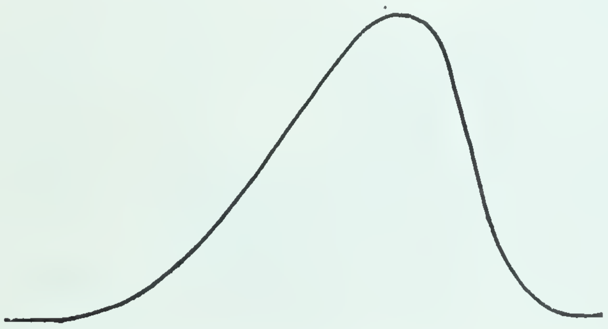
Among any large group of persons, animals, plants, or other things selected at random in their natural state, the individuals of the group exhibit differences. These differences exist in various qualities or characteristics, such as weight, length, shape, speed of movement, and many special traits or abilities. If we measure most of these characteristics with a suitable scale, we find that the individual measurements are distributed all along the scale from the lowest to the highest. If our sample is large enough and is representative, there will be only a few measurements that are very high and also a small number that are very low. As we move from either end toward the middle of the scale, the frequencies of the measurements gradually increase; at or near the middle is the greatest frequency.

There is a marked tendency for measures of a large group to take this form of distribution. The perfect mathematical form is called a *normal distribution.* It is pictured by a graph like the one below, which is called the *curve of normal distribution.*

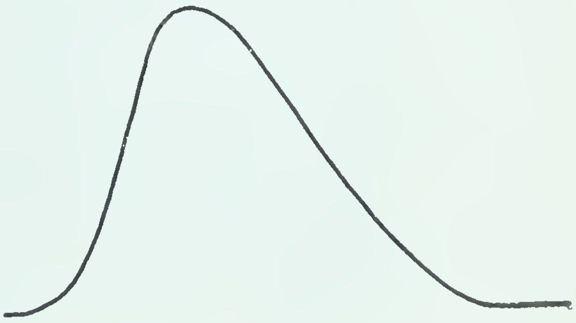


Curve of normal distribution

Seldom do we find actual distributions that correspond exactly to a normal distribution. Most distributions are *skewed distributions.* Examples of two skewed distributions are shown below.



Skewed to the left.



Skewed to the right.

Questions to Discuss and Problems to Solve

1. In distribution curves the vertical scale usually represents frequencies and the horizontal scale represents what is being measured.

(*a*) If you were picturing a distribution of the ages of all students in your school, what would probably be the range of the horizontal scale — that is, from the youngest to the oldest?

(*b*) How high would the vertical scale likely extend — that is, the largest number of children at any one age?

(*c*) Do you think the distribution curve would be skewed to the left or to the right? Explain.

2. Consider the distribution of incomes in the United States.

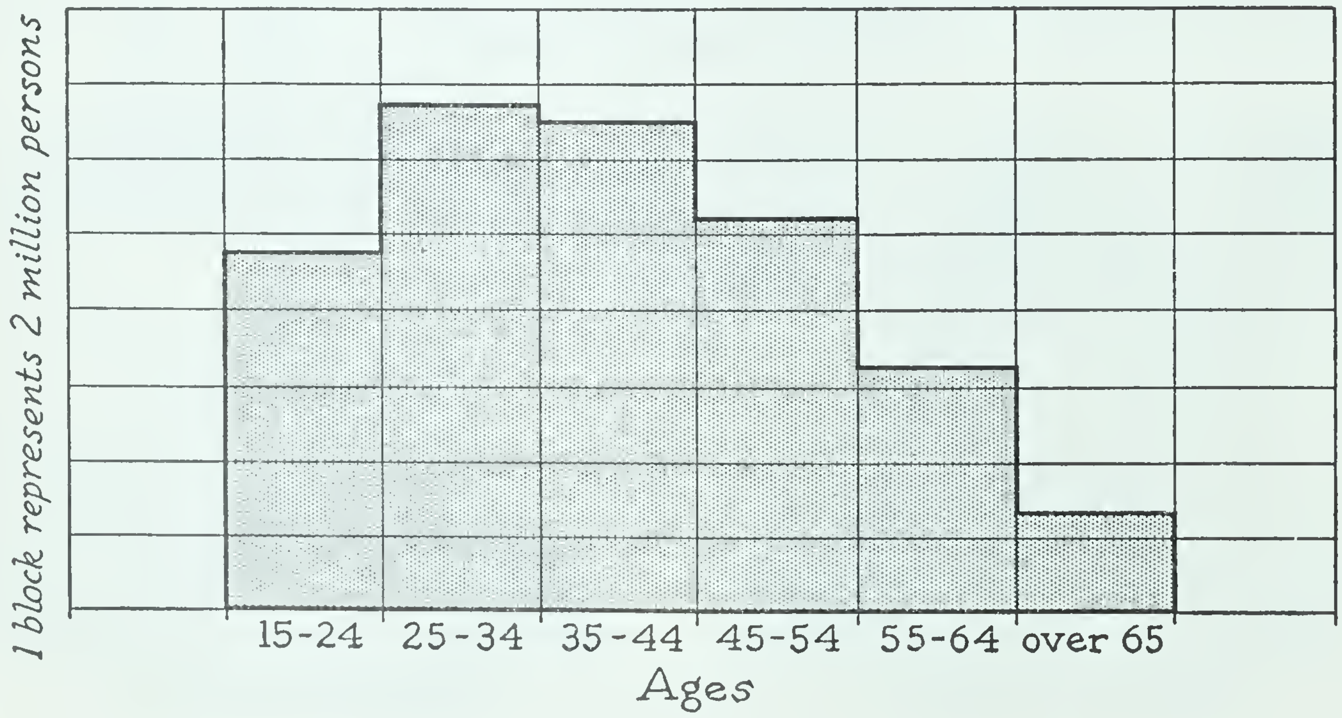
(*a*) How would you say the number of persons with annual incomes of $500 or less compares with the number who have incomes of $1 million and over?

(*b*) In general, do you think there are many more persons with incomes below average than there are very wealthy persons?

(*c*) Does your answer mean that your distribution curve of individual incomes would be skewed to the left or skewed to the right?

3. Here is a histogram showing the distribution of the employed civilian labor force in the United States by age groups in 1950.

EMPLOYED CIVILIAN LABOR FORCE IN UNITED STATES BY AGE IN 1950



(*a*) Is this distribution skewed to the right or to the left?

(*b*) If you drew a vertical line near the middle of the horizontal range of this distribution, at about what age would it fall?

(*c*) About how many million persons in the above distribution would lie below the age line mentioned in (*b*)? About how many million above?

4. If you tabulated the ages of all the students in your grade at your school, do you think you would get:

(*a*) A normal distribution?

(*b*) A distribution skewed to the right or to the left? Explain.

5. Committees of the class might investigate (*a*) the facts concerning participation in extracurricular activities in your school; (*b*) the results of a testing program in your school; or (*c*) the weights or heights of students in your class or school. Build frequency tables and construct the histograms.

6. When the leaves are falling, let each member of the class at some time pick up the first five unbroken leaves of one kind (large ones and small ones) that he finds.[1] Be sure all are from the same kind of tree; as sugar maple. Do you think this method will give a representative sample, a sample selected at random? Each student measures carefully the length of each leaf he has picked up. Make the measurements to the nearest sixteenth of an inch or the nearest tenth of a centimeter. To insure that the data are comparable, you must agree upon the part of the leaf to measure and the unit of measurement.

When all leaves have been measured, let a committee arrange the combined results from all the students in a frequency table on the blackboard. Now each student makes a graph of the table. Does it resemble the normal curve? Is it skewed to the right or to the left?

7. If the class is not too large, repeat the investigation of Ex. 6, having each student collect 10 or 20 leaves. Compare the histogram obtained from this sample with that in the preceding study. What conclusion would you draw if the two graphs looked very much alike?

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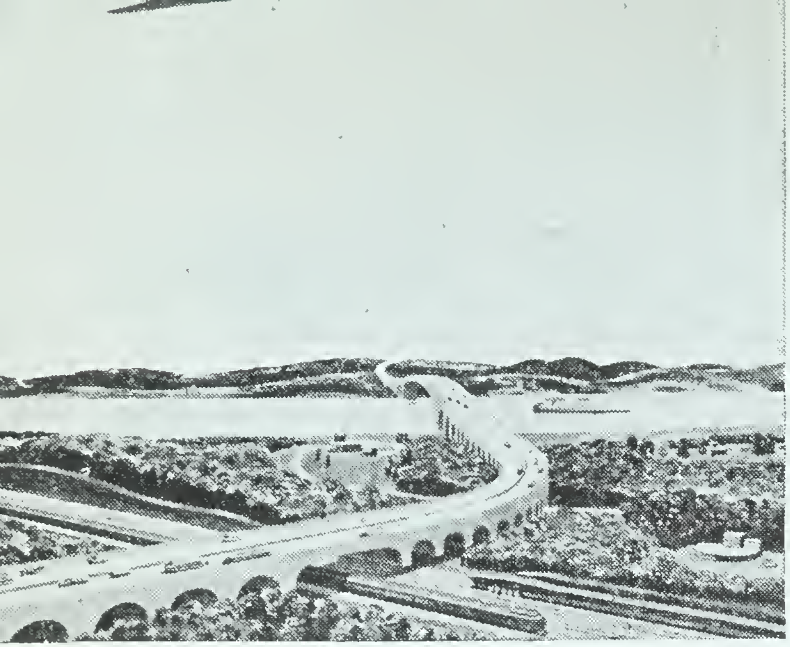
[1] TO THE TEACHER. The problem may be simplified by having students report the total number of sixteenths of an inch or the total number of millimeters. Thus a leaf $2\frac{3}{16}$ inches ($\frac{35}{16}$ inches) long may be reported merely as 35.



United Air Lines

We use the *mean* or *arithmetic average* when we speak of the speed of an airplane, a ship, an automobile, or a train.

PROBLEM IV

How Do We Use Averages to Add Meaning to Data?

The idea of *average* is not new to you. We speak of the average weight of a football team, the average score of a class on a test, the average temperature, or the average speed of a certain kind of transport plane. Averages are used in giving meaning to scattering data and in comparing groups.

When we use an average, we are making use of a *single* measure or number to represent all the different measures in a collection of scattering data. The average is the single number around which the scattering measures tend to center. It is called the *central tendency* of the data. There are three different measures or averages that can be used to describe or represent a whole group of data. They are the *mean,* or arithmetic average (pronounced ăr′ĭth-mĕt′ĭk); the *median,* or middle number; and the *mode,* or most frequent number. All of these are measures of central tendency. They are found in different ways and each adds its own special meaning to data.

The mean is the commonly used average.

What is generally spoken of as "the average" is the *mean.* It is the arithmetic average which you learned how to compute years ago, though you may not have called it the mean. In statistical reports the term *mean* is frequently used to refer to this common arithmetic average. When the Weather Bureau reports that "the mean temperature yesterday was 53," it tells us that the average of all the temperature readings taken yesterday was 53.

You probably know the rule for "finding the average" — that is, the mean. *To find the mean of several scores (or other measures), add the scores and divide the sum by the number of scores.*[1]

For her homemaking class Pauline Ibson asked 50 girls in her school to report the amount each spent for the dress she wore to the last formal dance. The table at the right summarizes Pauline's findings.

NUMBER OF GIRLS	AMOUNT SPENT FOR DRESS
1	$23
6	26
9	28
12	29
10	30
7	33
5	36

Pauline now wishes to find the mean cost. She could put down the cost of each of the 50 dresses and add them. However, a better way to find the mean is shown by the work below. Do you see how this is a short cut, especially if there are many items?

$$\begin{array}{rcr} 1 \times 23 & = & 23 \\ 6 \times 26 & = & 156 \\ 9 \times 28 & = & 252 \\ 12 \times 29 & = & 348 \\ 10 \times 30 & = & 300 \\ 7 \times 33 & = & 231 \\ 5 \times 36 & = & \underline{180} \\ 50 \times \underline{\ ?\ } & = & 1490 \end{array}$$

$$\begin{array}{r} 29.80 \\ 50\overline{)1490.00} \\ \underline{100} \\ 490 \\ \underline{450} \\ 400 \end{array}$$

or $30 to the nearest dollar.

Questions and Problems

1. Below are the weights of the members of two football teams. Find the mean weight (to nearest whole number) of each team.

	TIGERS			HORNETS	
189	207	187	184	160	179
172	158	184	173	150	175
168	170	143	163	162	135
159	164		236	163	

2. In comparing the two-o'clock and the ten-o'clock sections of her typing class, Miss Boardman computed the mean score of each section on the typing test. The scores of the two sections are given in the tables on pages 23 and 24. Compare the two sections by finding the means (nearest whole numbers).

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[1] This mean is also more exactly referred to as the *arithmetic mean.* There are other special means, such as the *geometric mean,* computed differently, but they do not concern us here. The term *mean,* when used alone in statistics, is always the *arithmetic mean.*

3. Here are the heights of the players on two basketball teams. Find the mean of each team (nearest quarter inch).

VARSITY	COLLEGIATE
$6'\,2\frac{1}{2}''$	$6'\,6\frac{1}{4}''$
$5'\,5\frac{1}{4}''$	$6'\,1''$
$6'\,5\frac{3}{4}''$	$5'\,7\frac{1}{2}''$
$5'\,11\frac{3}{4}''$	$5'\,7''$
$5'\,9\frac{1}{2}''$	$5'\,4\frac{1}{4}''$

4. The home rooms at the Wilkie Senior High School sold tickets for the annual football game with Central High School. Here are the sales by rooms. What was the mean (nearest cent) of the sales?

ROOM	PURCHASES	ROOM	PURCHASES
1	\$ 3.82	6	\$ 8.32
2	10.17	7	12.56
3	5.26	8	20.00
4	7.80	9	2.18
5	5.50	10	9.36

5. Height charts give the mean heights of children of different ages. In making a height chart for the students in a large school, a class obtained the following data for the 16-year-olds. What would be the mean height (nearest inch) to include in the chart?

HEIGHT	NUMBER OF STUDENTS	HEIGHT	NUMBER OF STUDENTS
5 ft. 2 in.	5	5 ft. 9 in.	108
5 ft. 3 in.	7	5 ft. 10 in.	102
5 ft. 4 in.	13	5 ft. 11 in.	83
5 ft. 5 in.	28	6 ft. 0 in.	32
5 ft. 6 in.	42	6 ft. 1 in.	10
5 ft. 7 in.	64	6 ft. 2 in.	3
5 ft. 8 in.	89		

6. In two weeks Dr. Barton made the following purchases of gasoline: 10 gal. at 18 cents; 8 gal. at $17\frac{1}{2}$ cents; 20 gal. at 19 cents; 5 gal. at 21 cents; 12 gal. at 18 cents. What was the mean price per gallon (nearest half cent)?

The mean may not be the best average to use.

The boys' physical education classes at Dick Amesworth's school held a basketball basket-throwing contest. Each student had 50 shots. The class with the highest average number of successful shots was to be the winner. The record for the two highest classes is given in this table.

CLASS A		CLASS B	
Number of Students	Baskets Made	Number of Students	Baskets Made
1	10		
2	14	1	15
2	16	2	16
3	19	3	20
5	23	3	23
5	26	4	25
3	28	3	27
2	30	1	29
1	43	1	34
1	45		
?	?	?	?

The mean for Class A is
604/25 = ?

The mean for Class B is
417/18 = ?

The students in Class B decided they would have won if it had not been for two students in Class A who were star players on the varsity basketball team.

In a case like this the *median* would probably be a fairer average to use. The median of a group of numbers is easy to find and readily understood. If you arrange the numbers in rank order, you simply take the middle number to find the median of the group.

If there is an *odd* number of scores (or other measures), there is one score at the exact middle of the group. That middle score is the median. For example, here are eleven numbers in rank order: 47, 51, 51, 52, 61, 63, 64, 67, 69, 72, 80. The middle number is the sixth from either end, which is 63. So the median is 63.

If there is an *even* number of measures, no one measure is at the exact middle. Then the median is the number halfway between the two numbers on each side of the middle. For example, here are twelve numbers: 43, 47, 51, 51, 52, 61, 63, 64, 67, 69, 72, 80. The middle is halfway between the sixth and the seventh numbers; that is, between 61 and 63. So the median is 62.

If the two measures nearest the middle in an even number of measures are 36 and 41, what is the median of the group?

The rule is: *To find the median of a group of numbers, arrange the numbers in rank order and then find the middle number.*

Questions and Problems

1. Find the median of this group: 16, 7, 23, 18, 15, 9, 68. Now find the mean. Why do they differ? Which measure gives the truer picture of the group, the mean or the median?

2. Find the median of this group: 8, 14, 9, 7, 4, 10, 11. Now find the mean. Why are the two measures equal?

3. Now look at the data from the goal-shooting contest on page 51. To find the median, we proceed as follows:

Total number of cases: Class A = 25. Class B = 18.

In class A the median will be the 13th score. In Class B the median will lie *halfway between* the 9th and 10th scores.

Counting from the bottom in Class A, the 13th score is __?__, the median for Class A.

Counting from the bottom in Class B, the 9th score = 25, and the 10th score = 23. The median is $23 + \left(\frac{25 - 23}{2}\right) =$ __?__.

If the median had been used, which class would have won?

4. School was in session 20 days last month at Isabelle Danver's school. The record of attendance in 4 home rooms is given below. Isabelle helps the clerk in the principal's office check the teachers' monthly reports. Should she have found any mistakes in these reports when the mean is reported to the nearest whole number?

Room 16		Room 35		Room 106		Room 22	
Days	Attendance	Days	Attendance	Days	Attendance	Days	Attendance
1	18						
2	19			1	21		
1	20	2	18	2	22	1	14
2	21	2	19	1	23	1	15
3	22	3	20	3	24	2	16
6	23	6	21	2	25	3	17
4	24	6	22	6	26	7	18
1	25	1	23	5	27	6	19
Mean = 22		Mean = 20		Mean = 25		Mean = 18	

Now find the median for each class and compare it with the mean.

The mode has its special uses as a measure of central tendency.

That the *mode* (which is the measure occurring most frequently in a collection of data) is sometimes a more satisfactory average to represent a group than either the mean or the median may be indicated by a simple problem. At the right is a frequency table showing the contributions of the students of one class to the community fund. How much did the typical or average person contribute? Or, expressed differently, what was the average contribution?

FREQUENCY TABLE OF CONTRIBUTIONS

No. of Persons	Amount Contributed
4	$ .05
17	.10
3	.15
1	.20
10	.25
9	.50
3	.75
1	1.00
1	20.00

The mean amount (arithmetic average) contributed is 66.9 cents. (Check by your own computation.) That is not a very helpful average, for only five persons out of the total of 49 gave more than that, and 44 gave less. Moreover, no one actually gave 66.9 cents.

What is the median? It is the amount given by the twenty-fifth person, counting from either end. How many gave that amount? Is that a better measure than the mean? Does the median give a wholly satisfactory impression of the group? Why?

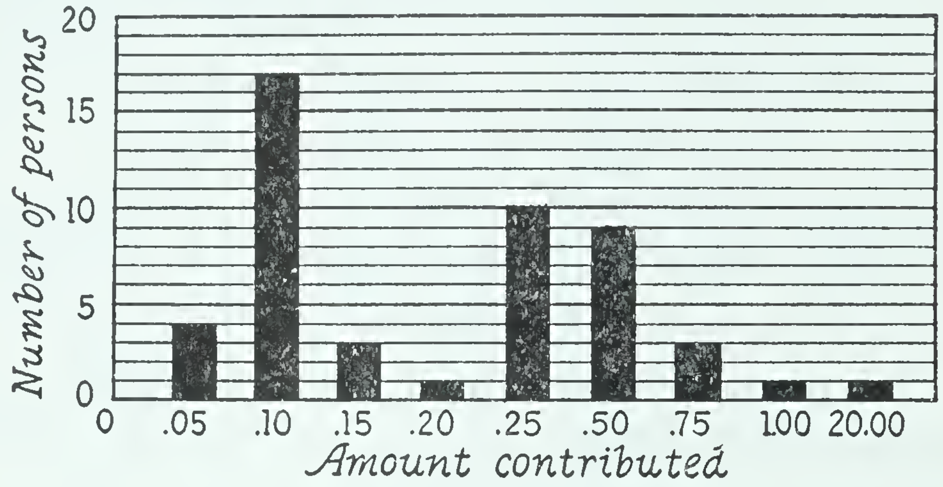
A glance at the table shows that 10 cents was the contribution made by the greatest number of individuals in the group. It is the most frequent contribution. Hence we say that 10 cents is the *mode* of the group. It probably gives a better idea of the average contribution of this group than either the mean or the median.

The mode is implied in such a statement as "The average number of rooms in houses in this part of town is 6," or "The average size of men's hats is 8." What is meant by these statements is that more houses have 6 rooms than any other number, and there are more men's hats of size 8 than of any other size.

We define the mode as that measure which occurs the greatest number of times or most frequently in a group of data. The measure that occurs oftenest is the *modal* measure. The word *mode* is a noun. *Modal* is the adjective that means "pertaining to the mode."

Below is a bar graph of the table of contributions given on page 53. In a bar graph the mode is noted very easily. Why?

CONTRIBUTIONS TO THE COMMUNITY FUND



Questions to Discuss and Problems to Solve

1. The word *mode* has a common meaning of "prevailing popular custom or style; fashion." Does the word as used in statistics have a similar meaning?

2. In the Johnson School the marks are A, B, C, D, and E. The principal says "C is our modal grade." What does he mean? Does the model student make the modal grade?

3. A class in mathematics had a test containing 10 problems on statistics. Two students reported 4 problems solved correctly, three had 5 problems correct, seven had 6 problems correct, nine had solved 8 correctly, two had 9 correct, and one had them all correct. What was the mode for the class? the mean? the median?

4. The Maury High School seniors helped with the local Red Cross drive. The numbers of memberships secured by the fifty members of the class are listed as follows:

5	4	12	6	3	6	13	4	6	15
6	5	6	9	5	6	9	11	13	11
10	6	4	11	8	5	7	16	2	6
18	8	6	5	7	4	6	8	1	4
11	6	13	6	2	15	5	9	7	10

Prepare a frequency distribution and determine the modal number sold. What was the mean? What was the median?

Averages should be understood and properly interpreted.

In everyday speech the word *average* is usually a synonym for mean, or arithmetic average. But in statistics three more specific or exact terms are preferably used when "averages" are referred to: the mean, the median, and the mode. All are averages or measures of the central tendency of a mass of statistical data. The mean is found by *figuring* the median by *counting*, and the mode by *inspection*. Each of these three measures has its advantages and its disadvantages.

If there are no very extreme measures in the data, the mean is probably the best measure of the central tendency of a group. If extreme measures are present, they will shift the mean unduly. In data where there are these extremes, the median, or middle term, is more satisfactory because it is easily found and it is not influenced by extreme measures. The median may, however, fall at a point in the scale where there are few items, or indeed none at all. In some instances the mode, or most frequent measure, is the average implied in ordinary speech, as the average size of men's hats. The mode is not influenced by the extreme measures in the data, but it is a satisfactory average only when there is a single pronounced grouping of measures in a statistical table.

Most of us want an answer in mathematics to be either "right" or "wrong." We are used to that, and so may be surprised to learn that no one of the three kinds of averages can be called "right," even when the three do not agree. This is true because in statistics there are usually several ways of approaching any given problem. It is left to the investigator to choose the approach that seems to him to give the most meaningful average in a particular situation. The old saying is, "Figures cannot lie." Of course, that is true; but figures can be misinterpreted, and in statistics they frequently are.

Questions to Discuss and Things to Do

1. Your teacher may wish to put on the blackboard 12 addition examples, each consisting of 5 addends of 2 digits each. See how many of these examples each student can copy and add correctly in 5 minutes. Arrange the scores in rank order and make a frequency table. (Do not make a grouped frequency table.)

2. For the data obtained in Ex. 1: (*a*) Find the modal score. (*b*) Find the median score. (*c*) Find the mean score. (*d*) Which best expresses the central tendency?

3. Try the same experiment with a multiplication test. Use 4-digit multiplicands and 2-digit multipliers, and allow exactly 5 minutes.

Averages may be computed from grouped data.

When data are grouped in preparing frequency tables, the exact values of the individual measures do not appear. Then we cannot compute the mean in the usual way, by adding all the measures and dividing the sum by the number of measures. Neither can we find the median by simply counting to the middle measure or number, because we are no longer working with the actual value of the middle number. We must compute these measures in special ways.

(1) In order to find the *mean* of the items in a grouped frequency table, we must first assume that all the items of each class interval are concentrated at the midpoint. We assume that all have the middle value of the interval. If the class interval for some test scores is 30 to 34 (an interval of 5), we assume that all the scores falling in that interval have a middle value of 32. If the interval is 30 to 39, the middle value of 34.5 is assumed.

With this assumption, the frequency table below, at the left, becomes the one shown at the right. The scores are no longer grouped by class intervals, but each interval is given its midpoint value. Notice that in the table at the right the differences between midpoints are the same as the differences in the first column of the table at the left.

SCORES ON ARITHMETIC TEST:
NINE-O'CLOCK SECTION

CLASS INTERVAL	FREQUENCY
90–99	2
80–89	4
70–79	4
60–69	6
50–59	8
40–49	2
30–39	1

MIDPOINT SCORE	FREQUENCY
94.5	2
84.5	4
74.5	4
64.5	6
54.5	8
44.5	2
34.5	1

The computation in finding the mean from the table at the right on page 56 follows. Check it.

2 × 94.5	189.0
4 × 84.5	338.0
4 × 74.5	298.0
6 × 64.5	387.0
8 × 54.5	436.0
2 × 44.5	89.0
1 × 34.5	34.5
The sum of 27 scores =	?

1771.5 ÷ 27 = ?
The mean score is ? to the nearest whole number.

The scores of the nine-o'clock section which we have just used are given also on page 38 in a rank-order table. Use that rank-order table to compute the exact mean. Is the approximate value computed from the grouped distribution close enough to the exact value for practical purposes?

(2) We can see how the *median* may be found for the items of a grouped frequency table by using as an example the table of test scores for which we have just found the mean. First we must know the number of items in all; in this case there are 27 scores. The median is the middle score; so it is the fourteenth score in order, counting from the highest (or lowest).

Next we start with the *highest* class interval and begin to add the intervals as we go down. For the three highest frequencies we have counted 2 + 4 + 4, or a total of 10 scores. We need to count 4 more scores to reach the fourteenth, which is the median. It lies within the next class interval 60 to 69, which contains 6 scores in all. In order to find its value, we must now assume that those 6 scores are distributed uniformly through the interval 60 to 69. Then to reach the fourth one of those scores, which is the median we are looking for, we must go $\frac{4}{6}$ of the way across the interval. The interval is 10, and $\frac{4}{6}$ of the way across it is $\frac{4}{6}$ of 10, or nearly 7. These 7 points of score must now be subtracted from the bottom of the next higher interval where we stopped counting. The bottom of that interval is 70. We may then say that the median is 70 − 7, or 63, which is approximate, but accurate enough for most practical purposes.

Now refer to the rank-order table of these same test scores, given on page 38. By counting we find that the exact median is also 63.

Questions to Discuss and Problems to Solve

1. The table below shows the weekly wages of girls in a department store. What class interval is used? The data are for how many girls?

WAGES OF GIRLS WORKING IN A DEPARTMENT STORE

CLASS INTERVAL	FREQUENCY	CLASS INTERVAL	FREQUENCY
$36.00–36.99	2	$30.00–30.99	4
35.00–35.99	8	29.00–29.99	0
34.00–34.99	9	28.00–28.99	2
33.00–33.99	7	27.00–27.99	6
32.00–32.99	5	26.00–26.99	14
31.00–31.99	6	25.00–25.99	2

(*a*) Find the mean wage in the above table. (HINT. The midpoint of the first interval is 36.495.)

(*b*) What is the greatest frequency? Theoretically the mode is between $26.00 and $27.00. Is this a satisfactory average? That is to say, does it characterize or describe the group? Specifically would it be correct to say that the typical girl gets something between $26.00 and $27.00 per week?

(*c*) Find the median wage. We are asked to find a weekly wage for which we shall be able to say that one half the girls in the department store receive less than this sum and that one half receive more than this sum.

(*d*) Which measure of central tendency seems to you best to represent this group of wage earners? Does each measure contribute something to the meaning of the data?

2. The 115 seniors at Isabelle Danver's school have all taken a general high school achievement test. The teachers have reported the results to the principal's office, where Isabelle prepared the grouped frequency distribution shown on page 59.

(*a*) What value should Isabelle get for the mean?

(*b*) What value should Isabelle get for the median?

Scores	Frequency	Scores	Frequency
80–84	4	50–54	16
75–79	6	45–49	12
70–74	10	40–44	7
65–69	18	35–39	2
60–64	19	30–34	0
55–59	20	25–29	1

Don't confuse normal with average.

James Hall came home from school and announced to his father, "Dad, I am underweight. We had physical examinations today and I weigh only 108 pounds. The teacher said that for my height and age I should weigh 123 pounds."

James's father became disturbed. He and Mrs. Hall decided that James should take vitamins and be put on a fattening diet. They overlooked entirely the facts that James slept well, was healthy and active, was gaining in weight regularly, and had firm muscles and a good appetite. Also they apparently forgot that they themselves, his father and mother, had been slender all their lives.

Moreover, Mr. and Mrs. Hall had confused being *normal* with being *average*. Height and weight tables give averages of large groups. Being normal in height or weight doesn't at all mean that your measurements have to be the same as the average of a large group. In fact, James Hall was perfectly *normal*. If he had weighed 123 pounds, he might have been overweight — for him.

Have you ever feared that you were too heavy, too light, too tall, or too short for your age? Many young persons, as well as their parents, become unduly disturbed over what they think is a condition of overweight or underweight. There may be a group of persons none of whose weights exactly equal the average of that group. Because no one's weight equals the average, wouldn't it be absurd to say that no one in the group has a normal weight?

Concern over one's "normal" body measurements frequently results from a faulty use of averages. We may use averages satisfactorily to compare groups. We may, however, make a serious mistake if we try to compare individuals closely with group averages.

You can perhaps decide more satisfactorily whether your height and weight are normal by comparing them with the height and weight of your parents, grandparents, and brothers and sisters, rather than by relying entirely upon a comparison with the average of some large group of persons of your age. If you are taller than the average for your age, there is no basis for you to feel superior. If you are very short for your age, there is no reason for feeling inferior; for weight and height have nothing to do with intelligence.

The following height and weight tables and the problems based upon them will give you an idea as to how averages can be used correctly. They will also indicate how frequency tables or frequency distributions of scattering measures of groups help in interpreting averages.

Questions to Discuss and Problems to Solve

1. Examine the frequency table below which gives the weights of 792 girls 18 and 19 years old. What is the range of weight in this frequency distribution? In a grouped distribution, the range is the difference between the midpoints of the lowest and highest intervals.

FREQUENCY TABLE OF WEIGHTS OF 792 GIRLS 18 AND 19 YEARS OLD[1]

WEIGHT (POUNDS)	FREQUENCY	WEIGHT (POUNDS)	FREQUENCY
85–89	2	145–149	29
90–94	17	150–154	21
95–99	26	155–159	11
100–104	57	160–164	7
105–109	85	165–169	3
110–114	97	170–174	5
115–119	108	175–179	3
120–124	108	180–184	3
125–129	72	185–189	0
130–134	66	190–194	0
135–139	42	195–199	1
140–144	28	200–204	1
		Total	792

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[1] "Women's Measurements for Garment and Pattern Construction," page 64. Miscellaneous Publication No. 454, U. S. Department of Agriculture.

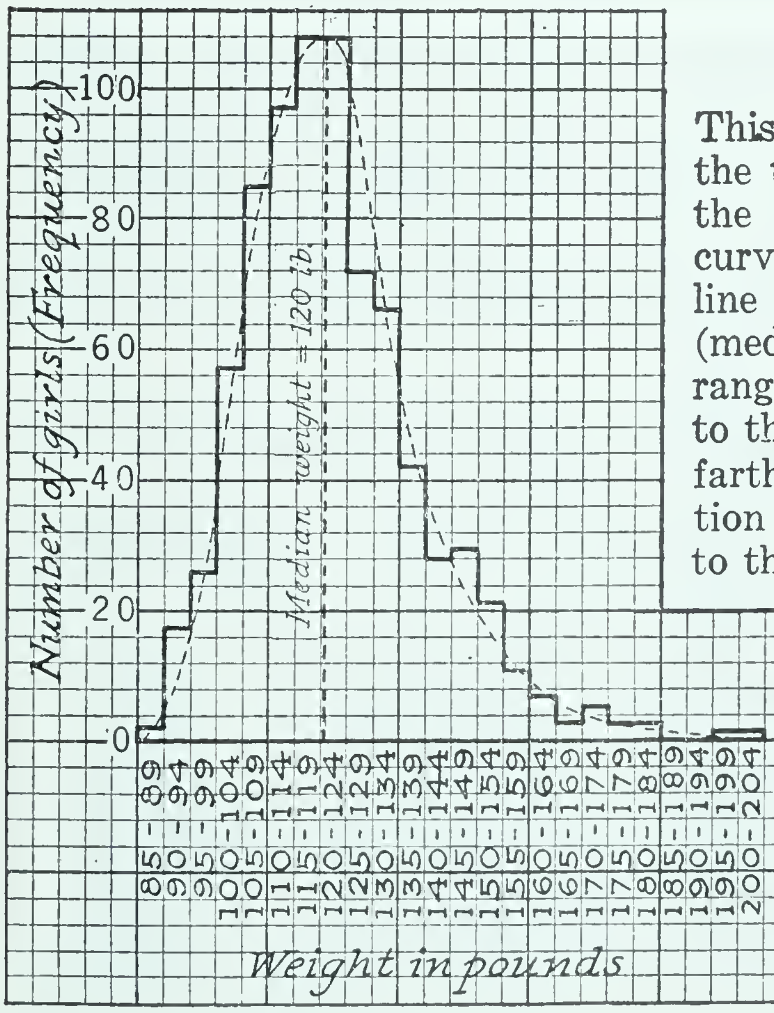
2. Find the mean (average) weight of this group (to nearest pound).

3. What is the median (average) weight?

SOLUTION. One half of all the girls is _?_. Between the *greatest* weight and the weight of 125 pounds there are _?_ girls. This means that 396 − 292 = _?_ girls must be taken from the 120–124-pound group, which originally contained 108 girls. Since the interval is 5, we must go $\frac{?}{108}$ of 5 = _?_ from the weight of 125 pounds, which we last considered. Thus the median weight is _?_ pounds to the nearest whole pound.

4. Some insurance companies consider that from 15 to 20 per cent above or below average (median) includes the range of normal weight. Fifteen per cent below 120 pounds is _?_. Fifteen per cent above is _?_. How many girls exceed the 15 per cent above-median weight? (HINT. $\frac{2}{5}$ of the 42 girls in interval 135–139 must be added to the others above this interval.) How many girls fall below the 15 per cent below-median weight?

5. How much would the girls in the 85–89 interval (midpoint 87) have to increase their weights to equal the 15 per cent below-median weight? How much would those in the 190–194 group have to reduce their weights to equal the 15 per cent above-median weight?



WEIGHTS OF 792 GIRLS 18 AND 19 YEARS OLD

This histogram is made from the data of the table on page 60. Notice that while the outline tends toward a bell-shaped curve, the curve is not symmetrical. The line representing the central tendency (median) is to the left of the middle of the range of weights; the frequencies trail off to the right of the central tendency much farther than to the left. Is this distribution normal or is it skewed to the right or to the left?

6. As the foregoing exercises indicate, many persons cannot safely make their weights "normal" when average weight (mean or median) is the only basis of comparison. In most standard weight tables, this fact is taken into account by considering both height and age in relationship to weight. Mistakes can, however, easily be made in using such height-weight tables. Can you read this table correctly?

THE GROWTH RECORDS OF TWO BOYS

AGES (YR.) ⟶	10	11	12	13	14	15	16	17
John's height (in.)	54	56	58	60	62	64	66	67
John's weight (lb.)	64	70	76	85	95	106	115	122
Standard wt. for John	70	77	85	93	103	115	128	136
James's height	53	55	57	59	63	64	66	66
James's weight	76	84	92	103	120	130	137	130
Standard wt. for James	67	73	81	89	108	115	128	132

(*a*) What per cent was John's weight below standard at ages 15, 16, and 17? (*b*) What per cent was James's weight above or below standard for these ages? (*c*) Which boy had the more nearly normal weight at age 17? Why? Don't be misled by average standards.

7. Represent by four different lines on a line graph (*a*) John's weight, (*b*) John's standard weight, (*c*) James's weight, (*d*) James's standard weight — ages 10 to 17. In general, how do the changes in each boy's weight compare with the changes in his standard weight? How do these graphs indicate that these boys have or have not *grown* normally?

8. At the right is a table which shows standard *growth* in weight for boys from 10 to 17 years old. Represent in three lines on a graph the actual increases in John's and James's weights and the increases that are considered standard in the table from ages 10 to 17. What would you say now about how closely to standard the weights of these boys changed between the ages of 10 and 17?

GROWTH IN WEIGHT FOR BOYS

AGE	STANDARD WT. INCREASE
10 to 11 yr.	$6\frac{3}{4}$ lb.
11 to 12 yr.	$8\frac{1}{2}$ lb.
12 to 13 yr.	$10\frac{3}{4}$ lb.
13 to 14 yr.	$13\frac{1}{4}$ lb.
14 to 15 yr.	$10\frac{1}{2}$ lb.
15 to 16 yr.	$7\frac{1}{2}$ lb.
16 to 17 yr.	$4\frac{1}{2}$ lb.

AVERAGE WEIGHT IN POUNDS ACCORDING TO HEIGHT AND AGE

(As ordinarily dressed)

Based on the Medico-Actuarial study of more than 200,000 insured men

HEIGHT (with shoes on) Feet	Inches	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54
5	0	113	119	124	127	129	132	134	135
5	1	115	121	126	129	131	134	136	137
5	2	118	124	128	131	133	136	138	139
5	3	121	127	131	134	136	139	141	142
5	4	124	131	134	137	140	142	144	145
5	5	128	135	138	141	144	146	148	149
5	6	132	139	142	145	148	150	152	153
5	7	136	142	146	149	152	154	156	157
5	8	140	146	150	154	157	159	161	162
5	9	144	150	154	158	162	164	166	167
5	10	148	154	158	163	167	169	171	172
5	11	153	158	163	168	172	175	177	178
6	0	158	163	169	174	178	181	183	184
6	1	163	168	175	180	184	187	190	191
6	2	168	173	181	186	191	194	197	198

Based on the Medico-Actuarial study of more than 130,000 insured women.

Height (with shoes on) Feet	Inches	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54
4	11	110	113	116	119	122	126	129	131
5	0	112	115	118	121	124	128	131	133
5	1	114	117	120	123	126	130	133	135
5	2	117	120	122	125	129	133	136	138
5	3	120	123	125	128	132	136	139	141
5	4	123	126	129	132	136	139	142	144
5	5	126	129	132	136	140	143	146	148
5	6	130	133	136	140	144	147	151	152
5	7	134	137	140	144	148	151	155	157
5	8	138	141	144	148	152	155	159	162
5	9	141	145	148	152	156	159	163	166
5	10	145	149	152	155	159	162	166	170
5	11	150	153	155	158	162	166	170	174
6	0	155	157	159	162	165	169	173	177

Metropolitan Life Insurance Company

9. Your class might like to undertake an investigation of the relationship of weights of children to those of their near relatives. Select several students who are considerably below and several who are considerably above average in weight. Record their ages, heights, and weights. Next obtain for each student the age, height, and weight of an adult member of his immediate family of the same sex. Then use the table on page 63 to find the average weight for each student and relative. Find the per cents by which the actual weights are above or below average. Represent these per cents in double bar graphs for each student and his relative. Do these graphs indicate any influence of heredity on weight? Be careful not to overgeneralize.

10. The class might next compare their own heights with those of adults in their families. To do this, each member of the class should find out the height (to the nearest half inch) of an adult member of his immediate family (father, mother, brother, sister) of the same sex as himself. Then he should write on a small piece of paper his own height in inches (to the nearest half inch) and under it that of his relative, and hand this to the teacher. The heights should then be written on the blackboard in two groups, one giving the distribution of the heights of the adults and the other giving the distribution for class members. The class can then compute averages and make frequency tables and histograms for the two distributions in order to compare the two groups.

11. Secure the heights of a number of 15-, 16-, and 17-year-old boys. Arrange them in a frequency distribution similar to the one shown here. Make histograms of the two distributions and compare them as to shape. You may also compare the mean and median heights of the two groups.

The exercises and investigations should have helped to make clear the fact that great care must be exercised in comparing individuals with group averages. This is particularly true when we are trying to decide what is "normal" growth for an individual.

DISTRIBUTION OF HEIGHTS IN INCHES OF 833 BOYS 15, 16, AND 17 YEARS OLD

HEIGHT IN INCHES	FREQUENCIES
76	1
74	2
72	15
70	71
68	164
66	217
64	216
62	94
60	35
58	13
56	3
54	2

Courtesy Bates College

These students of sociology are preparing charts and maps to present statistical data on population trends. Many different persons will use the charts and maps and draw conclusions from these data.

PROBLEM V

What Guides Should Be Followed in Drawing Conclusions from Data?

After data have been collected and have been organized and arranged to give them meanings, there is still an important step, the really exciting part of statistics. It is interpreting or drawing conclusions from the data.

The statistical worker who is making the investigation is not the only one who draws conclusions from data. All of us see and refer to statistics that other persons have collected and presented in tables and graphs, perhaps in the form of averages and distributions. We often need to reach our own conclusions and form opinions based upon our own interpretations of data that are furnished by someone else.

As you have already seen, data must be collected and presented so that proper interpretations may at last be made. But however carefully that work may be done, the job of drawing conclusions requires both straight thinking and an understanding of some mathematics. In drawing conclusions, we frequently find it desirable or even necessary to "read something from the data" which is not actually there, but is indicated by the data. We attempt to estimate that certain things would be true because the facts that are available point to that conclusion. In other words, we sometimes try to *predict* something or we attempt to make a *general* statement based upon the particular data.

In this interpreting, mistakes may occur if we are not careful, particularly about three points — reading between the data; reading beyond the data; and overgeneralization. Experienced workers in statistics know how to avoid these mistakes by observing the guides or rules which are discussed in this last problem.

We must be careful in "reading between the data" where figures are missing.

(1) Suppose we have been given the data that an airplane passed over city A at 7:00 P.M., flying toward city B, and that it passed over city B at 9:00 P.M. From these data we wish to determine the time at which the plane was over town C, which is halfway between A and B. In order to do this, we must "read between the lines."

We can say that the plane was at the halfway point at 8:00 P.M., because 8 o'clock is halfway between 7 o'clock and 9 o'clock. Under what conditions could we be sure that our answer is correct? If you cannot answer this question now, you will be able to do so after the next examples.

(2) In using tables we frequently need to "read" values that are missing. For example, the table at the right shows the amount of bonus a salesman receives on sales above his monthly quota. It is computed on a basis of a bonus rate of 6 per cent. Suppose we wish to use this table to find the bonus on excess sales of $250. The amount of $250 is halfway between the values of $200 and $300 given in the table. Therefore the bonus should be halfway between $12 and $18, or $15. We know, of course, that $15 is the correct answer.

BONUS AT 6%

SALES	BONUS
$100	$ 6
200	12
300	18
400	24
500	30
600	36

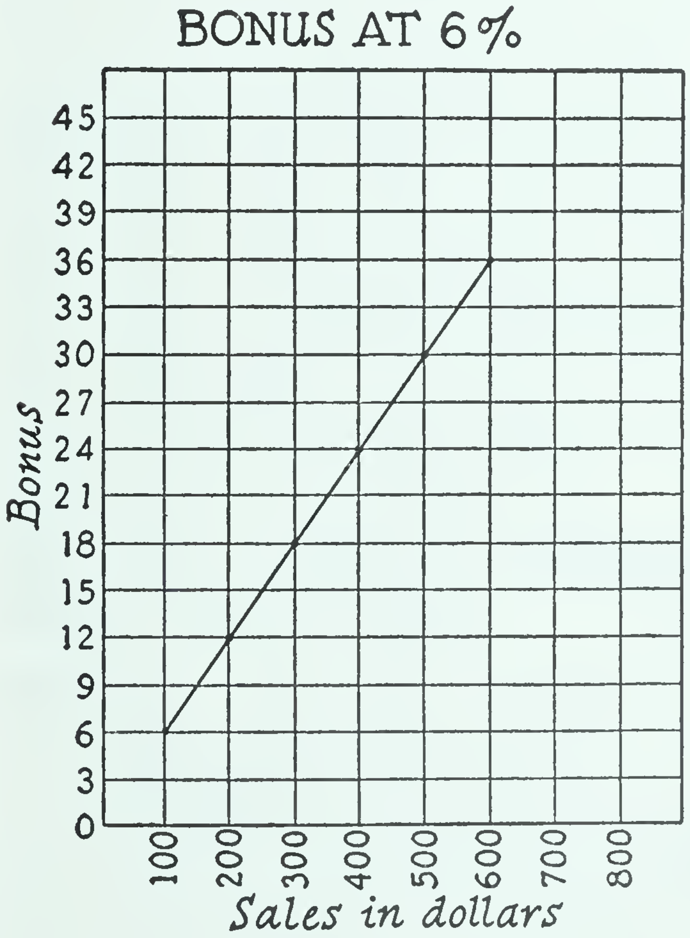
This procedure of finding values between known values, or obtained data, is called *interpolation* (ĭn-tûr′pō-lā′shun).

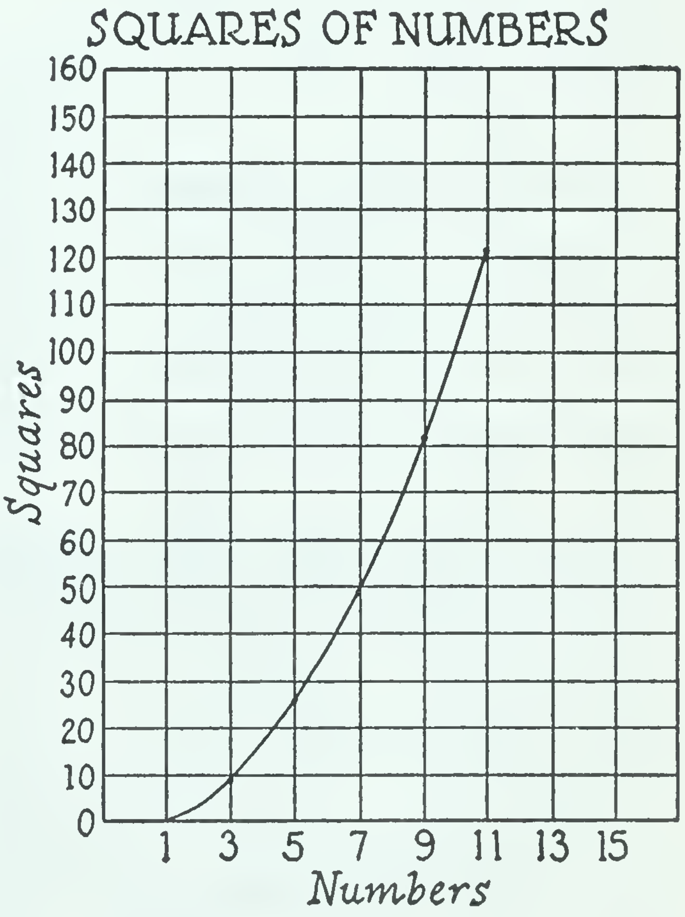
(3) There are conditions where interpolation will not give the exact answer but merely an approximation. Consider the accompanying table, which shows the squares of numbers. Suppose we wish to use this table to find the square of 6. We may say that 6 is halfway between 5 and 7; therefore, the square of 6 should be halfway between 25 and 49, or 37. We know, of course, that the square of 6 is 36. Our answer estimated from the table is only approximate, but it will be close enough in many practical problems.

SQUARES OF NUMBERS

NUMBER	SQUARE
1	1
3	9
5	25
7	49
9	81
11	121

(4) The question now is: When can we interpolate and obtain exact results, and when can we obtain only approximate results? The two line graphs of the tables we have just used will help in answering this question.





We can obtain exact results by interpolation when the change that takes place between the two known points, or values, is uniform; that is, if in a graph we can connect the two known points by a straight line (as in the bonus graph above, where each $100 increase in sales is accompanied by a $6 increase in bonus).

If the change from one known value to the next is not uniform, then interpolation gives an approximate result. A graph showing the relationships for such data is a curved one (as in the graph of squares). The more the line of relationship is curved, the farther our interpolated answer is likely to be from the correct answer.

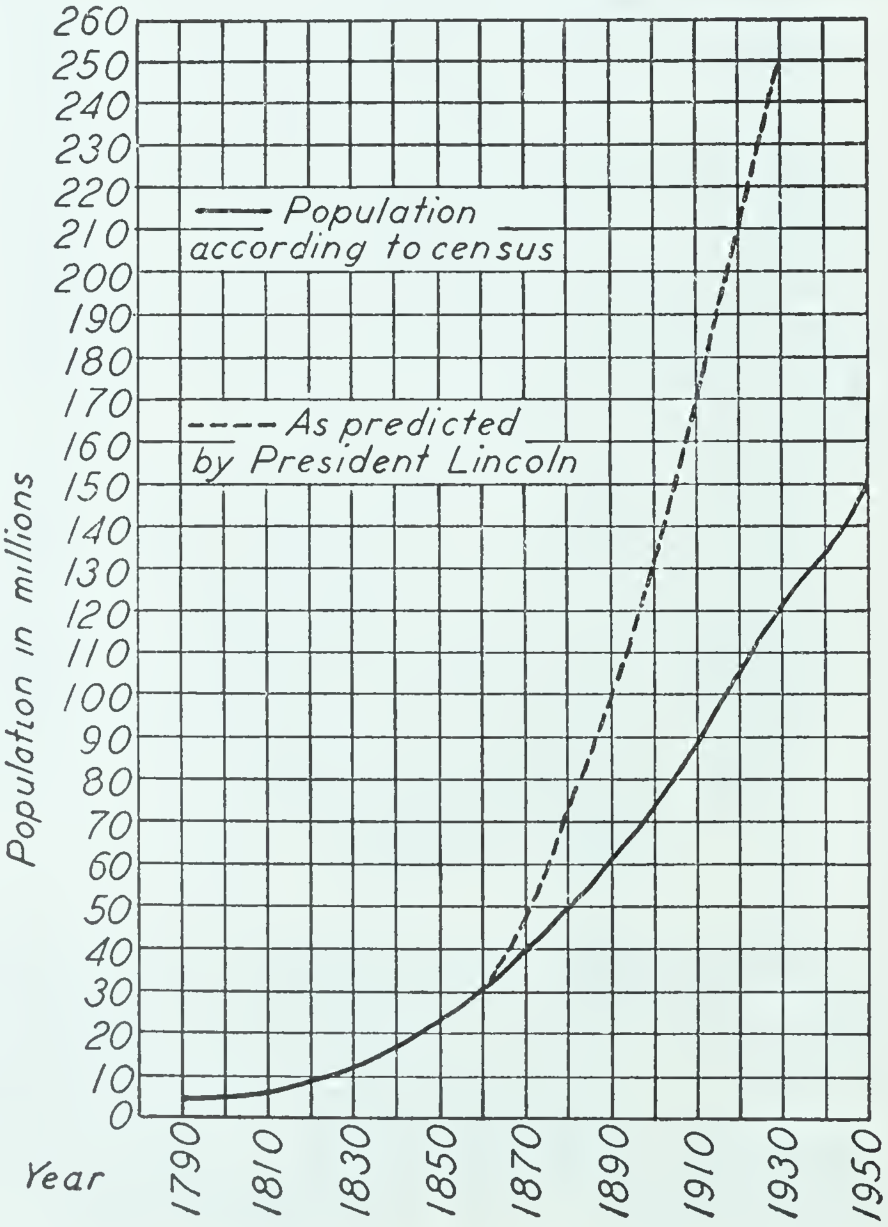
Now consider again the airplane in our first example. It would be over town C (halfway between cities A and B) at 8:00 P.M. if it flew at a uniform rate of speed all the way. If, however, it flew at varying speeds, we should not be able to tell exactly when it was over town C.

We must be careful in attempting to "read beyond" the data.

Sometimes, in drawing conclusions from data, we wish to predict what may happen at points beyond those for which we have available data. Then we are attempting to "read beyond" our data.

(1) In his second message to Congress, President Lincoln predicted that the population of the United States would be 251,689,914 in 1930. He based his prediction on the census data of population for the period 1790 to 1860. In those 70 years the population had increased from 3,900,000 to 31,400,000, or about 8 times. He attempted to "read beyond" his data for 70 years into the future. At that time it seemed reasonable that the rate of increase in population would continue as it had in

POPULATION GROWTH



the past. This graph shows how far wrong President Lincoln's prediction was. Why do you think his prediction didn't come true?

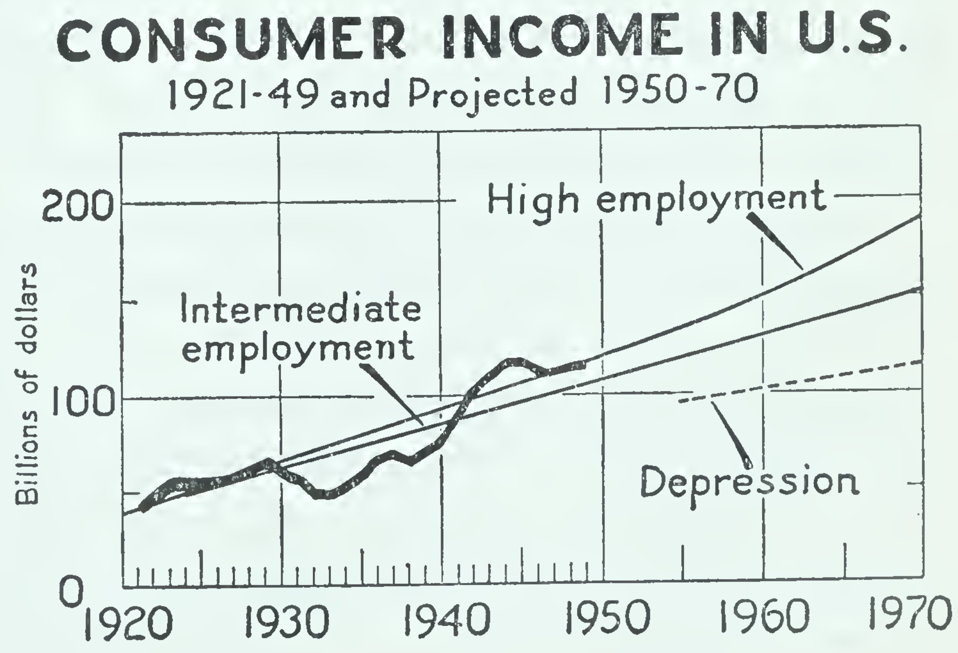
The procedure of finding values beyond or outside the known values or obtained data is called *extrapolation* (ĕks′trȧ-pȯ-lā′shun). When a person studies his data and then predicts what will take place beyond the range of the data, he *extrapolates* (ĕks′trȧ-pȯ-lats or ĕks-trăp′ō-lats). How are extrapolation and interpolation similar? How are they different?

(2) As in interpolating data, we can extrapolate and obtain exact predictions only when the data arrange themselves with uniform differences so that the curve of the data is a straight line.

Refer to the table of bonus at 6 per cent rate and to the bonus graph, page 67. By extrapolation we can continue the straight line indefinitely. Thus we find the exact bonus on $700 is $42.

Consider next the graph of squares of numbers on page 67. This graph, like the bonus graph, is based on a definite mathematical relationship between numbers. But the graph is a curve and since the curvature is constantly changing, it is not advisable to extrapolate. In this case the exact values should be computed. By computation the curve can be extended accurately as far as desired. In general, we should confine the use of extrapolation to conditions which follow a general trend but have no exact mathematical relationship.

(3) In the following graph, statisticians in the U. S. Department of Agriculture have extrapolated consumer income data 20 years ahead.



(*a*) Does it seem reasonable to you that a curve as irregular as this one was between 1930 and 1949 should become almost a straight line between 1950 and 1970? Can you explain how the high and intermediate lines were probably obtained?

(Continued on p. 70)

(*b*) What are some world conditions that might make the real curve turn down sharply as it did in 1929–1932? that might make the real curve turn up sharply as it did in 1943–1947?

(4) Extrapolation may also support a guess as to what happened before observations started. For example, Frank Gobel, age 15, is picked up by the police three times in one month for petty thieving. The judge of the juvenile court, inferring (extrapolating) that thieving isn't a trait that Frank has learned recently, sends for Frank's school record. By extrapolation, what do you guess his school record was?

We must be careful not to infer causes or draw conclusions which the data do not justify. We must not overgeneralize.

An investigation made some years ago reported that high school graduates received on an average a total in wages and salaries of $78,000 by the time they were 60 years old. On the other hand, men who did not go to school had received only $45,000 on the average by the time they were 60 years old. The difference in total incomes from wages and salaries for the averages of these two groups was, therefore, $33,000.

These data were interpreted as meaning: Every day you go to school is worth $15. This interpretation was widely used without reservations in the public press and in books. It must be admitted that the figure $15 is rather plausible to the unthinking person. It is obtained by multiplying 180 days in one school year by 12 to get 2160 as the number of days in 12 years of schooling. Then, by dividing $33,000 by 2160, we get approximately $15 per day.

But other factors besides school training no doubt contributed to the financial success of the high school graduates. Can you mention a few? From these data we know only what the difference is between the average total income of high school graduates and of those who did not go to school at all. The data do not tell us what *caused* the difference. When we attempt to say that each day of school contributed $15 to the average total income, we are reading into the data information as to causes, which is not there. We are making the mistake of drawing a conclusion without considering all the factors involved. In other words, we are overgeneralizing.

Questions to Discuss and Things to Do

For each of these statements ask yourself: (*a*) What is wrong with this conclusion? (*b*) What additional data do I need to support the conclusion?

1. *Data:* The students from Eastern Elementary School do not do as well when they go to high school as do the students from Western Elementary School.
   Conclusion: Therefore, the teachers at Eastern must not be as good as those at Western.

2. *Data:* In a certain community the average income of the families whose children elect Latin in high school is much larger than the average income of the families whose children do not elect Latin.
   Conclusion: The way to increase your own family's income is to elect Latin in high school.

3. *Data:* Investigations have shown that the most accurate computers are in general the fastest. Bill is very inaccurate in his computations and he is not very fast.
   Conclusion: The way to increase Bill's accuracy in computation is to make him work faster.

4. *Data:* Watch this one! Two hunters went directly south 60 miles, then turned and went directly east 60 miles. They killed a bear at that point, turned and went directly north 60 miles, arriving at the spot from which they had started.
   Conclusion: The color of the bear which they killed was white.[1]

5. *Data:* Carl and his father each have friendly dispositions and brown eyes. Carl's mother is quarrelsome, a "spitfire" with blue eyes.
   Conclusion: Carl inherits his trait of friendliness and his brown eyes from his father's side.

---

[1] We are not quite fair to you when we slip a joker into this list. This conclusion, however fallacious it may seem to you, is nevertheless rigorously logical.

How do assumptions affect conclusions?

Have you not time and again seen two persons start with the same facts and draw conflicting conclusions? Often the explanation is that each starts with a different assumption about the data or either of them allows assumptions based on individual prejudice to creep into the very structure of his reasoning. An assumption is something we take for granted — something we don't stop to prove. You will grant that in many situations we can't take the time to prove everything. So we take something for granted — we make assumptions, and usually without ever taking the trouble to state them for the benefit of other persons.

Here's an example:

Mr. and Mrs. Hale are trying to determine whether they should or should not buy a television set.

Mrs. Hale concludes that it will be a good investment for the family. Her assumptions are:

(*a*) A TV set will keep the children at home for their entertainment.
(*b*) The family will save on other entertainment costs.
(*c*) The programs will be valuable educationally.

Mr. Hale concludes it would not be a good investment for the family. His assumptions are:

(*a*) The programs will keep the children indoors too much and limit the amount of healthful outdoor exercise.
(*b*) The children will elect to see the mystery, comedy, and athletic programs rather than the really educational ones.
(*c*) The family will soon grow tired of this one type of entertainment and spend as much money on other entertainment as before.

We have no way of knowing whether either set of assumptions is correct. We do know that each conclusion is reasonable if we accept the corresponding assumptions. No amount of arguing will decide which conclusion is right until there is proof as to which assumptions are right.

Consider another example; this time a problem of government. A few years ago when a Virginia governor presented his budget requests to the state legislature, *The Richmond Times-Dispatch* published an editorial, the title of which was "If!" On the next page are two paragraphs from this editorial:

> "If the sacrifice by the people of giving $21,000,000 of new taxes is a lesser one than doing without the things the state will buy with $21,000,000, then the new taxes should be imposed.
>
> "If the ever-growing facilities and ever-growing taxes to operate these facilities together produce services of value in excess of costs, then the system is a good one and should be encouraged."

By starting these sentences after the word "If", you would be starting with definite assumptions. What would they be?

Differences of opinion about difficult political and social problems are frequently caused by different assumptions somewhere along the line. The root of many a childish quarrel is a difference of assumptions. In interpreting data you need to watch your step to make certain that you know what assumptions have been made.

Questions to Discuss and Things to Do

Can you spot the assumptions operating in each of the following? Do you accept them as true and correct assumptions?

1. Archie Jessup was a star football player in high school. After graduation he applied for a job in a bank. Archie told the president about his athletic achievements. Promptly the president remarked, "I guess we can't use you. We want people in this bank who have made good scholastic records."

2. Mr. Harris is the principal of Central High School. He has kept a record of the pupils in Central who have dropped out of school during the past several years. His figures show that about twice as many boys as girls have dropped out. When he mentioned his findings at a parent-teachers' meeting, one parent said, "It is obvious that we need more men teachers at Central." Another stated, "I disagree. It seems to me a clear case for more shop courses."

3. Several girls applied for the same job in an office in their home town. The office manager gave them all clerical ability tests and obtained personality ratings from their commercial teachers. Mary Keller made the highest score on the test, and Alice Hamlin made second highest. Alice was given a much higher personality rating than Mary. The office manager picked Alice for the job.

Practice in interpreting statistics.

Following are four different sets of statistical data designated as problems *A* to *D*. Beginning with problem *A*, you will first examine the data. Then consider carefully the numbered statements or questions following the data and determine your answers. Keep in mind the safeguards in interpreting statistics which you have just studied.

A. Here is a report on the publication and circulation of newspapers and magazines in the United States.

		NUMBER OF PUBLICATIONS	TOTAL CIRCULATION IN MILLIONS	CIRCULATION PER PERSON
Daily Newspapers	1940	1878	41	.31
	1950	1772	54	.36
Sunday Newspapers	1940	525	33	.25
	1950	549	47	.31
Magazines	1940	230	100	.76
	1950	264	179	1.19

1. Did the number of daily newspapers increase or decrease between 1940 and 1950? In 1950 the number of daily newspapers was _?_% of the number in 1940?

2. In 1940 the population of the United States was 131,669,275, and in 1950 it was 150,697,361. Now look in the table above at the column headed "Circulation per Person." Does this column indicate that the circulation of daily newspapers increased more rapidly, or less rapidly, between 1940 and 1950 than did the population? Explain. Was this also true of Sunday newspapers? of magazines?

3. If you were going to open a sales agency for a particular region, would this table help you to decide whether to handle newspapers or magazines? Explain.

4. What, if anything, does this table tell you about the reading habits of American people?

5. Sally says she believes that radios account for the smaller per capita circulation of newspapers than of magazines. What assumption do you think she is making as a basis for this belief?

6. Can you tell from the figures whether more magazines are read by families in cities or by families in the country?

B. Here are some interesting data reported by the Bureau of the Census on distribution of income in this country. The facts pictured in this table represent a highly significant change. Read them carefully, then turn to the questions below to see if you can interpret such data correctly.

DISTRIBUTION OF HOUSEHOLDS IN EACH INCOME GROUP

AMOUNT OF YEARLY INCOME	PER CENT OF HOUSEHOLDS IN EACH INCOME GROUP		
	1939	1945	1950
Under $1000	41.2%	18.3%	13.6%
$1000–$2000	34.3	21.4	13.2
$2000–$3000	15.0	25.2	19.3
$3000–$5000	7.2	26.3	34.8
$5000 and over	2.3	8.8	18.9

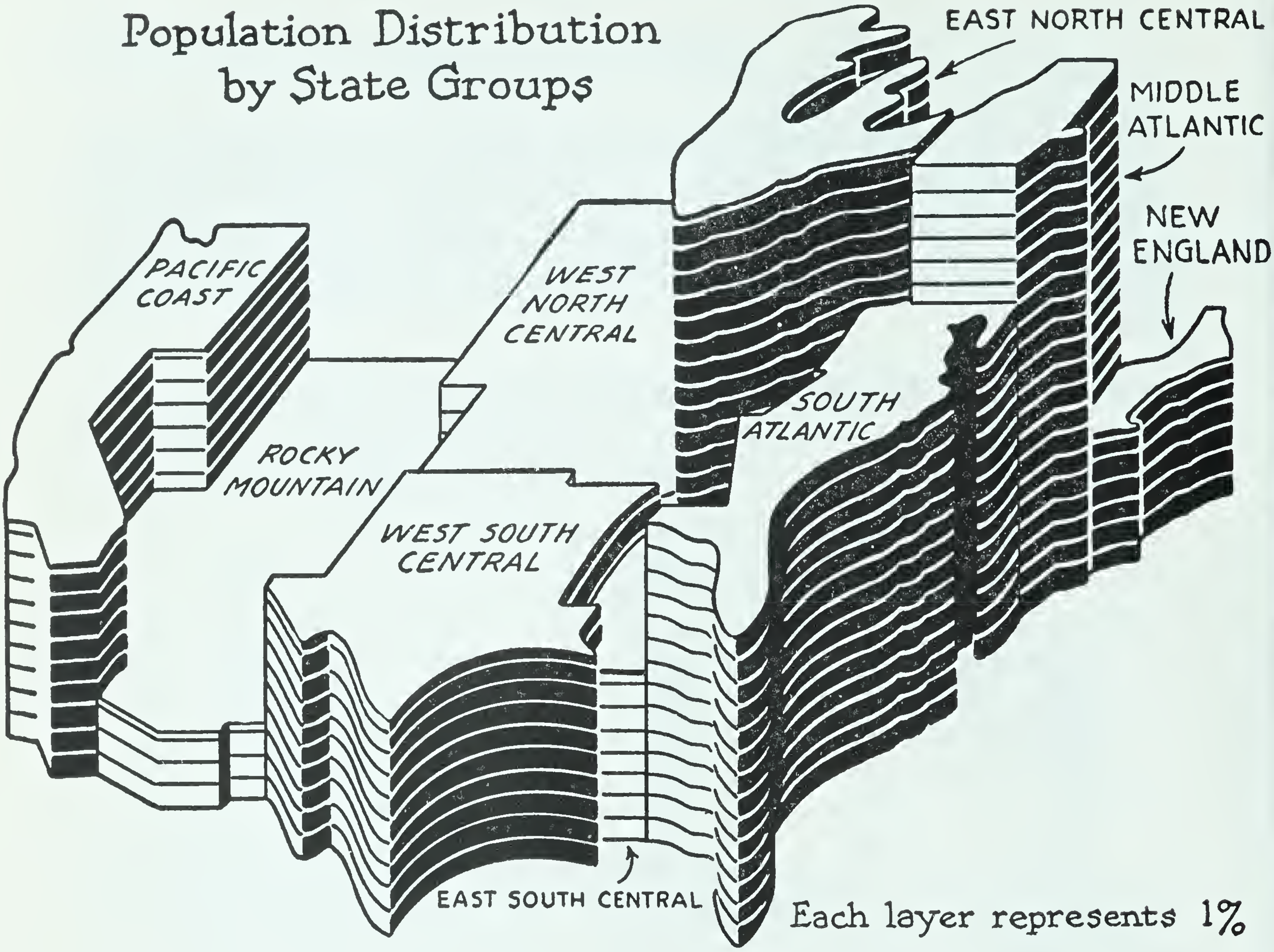
1. In 1939 only 24.5 per cent of the households in the United States had yearly incomes of $2000 or more. What was the comparable per cent in 1945? in 1950?

2. Do these data indicate that the standard of living increased substantially in this country between 1939 and 1950? What additional facts would you like to have before you can be certain how to answer this question?

3. Look at the per cents of households with incomes less than $1000 in 1939 and in 1950. Note that 13.6% is about $\frac{1}{3}$ of 41.2%. Does this mean that there were about $\frac{1}{3}$ as many households in this income group in 1950 as in 1939? Before answering this, remember that the population increased sharply between 1939 and 1950.

4. Consider population increases between 1939 and 1950 as you answer this one. Was the probable number of households in 1950 with incomes in the $3000–$5000 group more or less than 5 times as many as they were in 1939? Explain your answer.

5. Do these data show that there were many more millionaires in this country in 1950 than in 1939? Why?



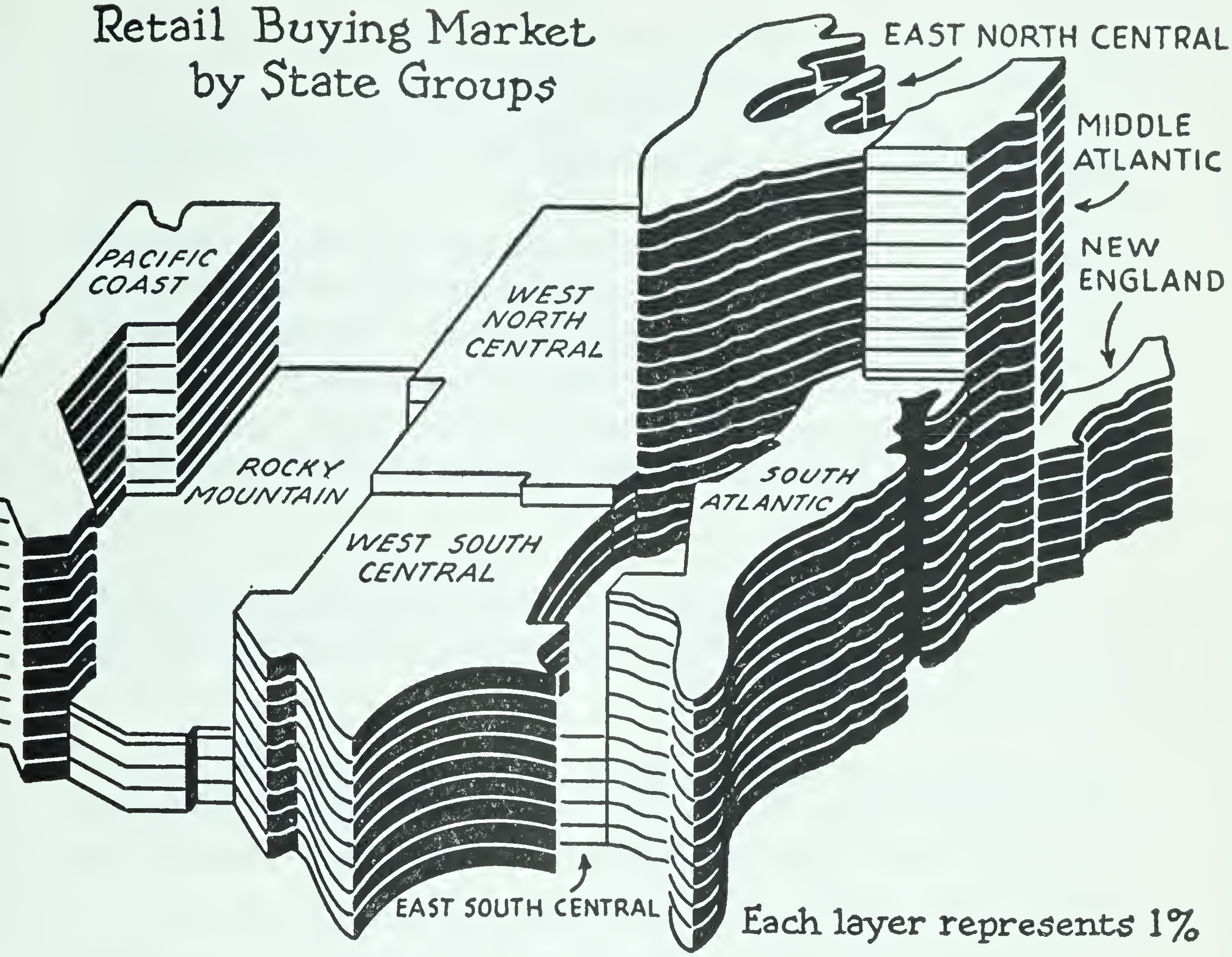
C. Above and on page 77 are two unusual graphs. One shows the population distribution in the United States by state groups, and the other shows the distribution of retail buying by the same state groups.

1. Do the two graphs appear to be similar in their general appearance? What relation does this appearance indicate between the population distribution and the distribution of retail buying in our country?

2. Which group of states has the smallest per cent of the total population in the United States? What is that per cent? Does this group also have the smallest per cent of retail buying? What is it?

3. What per cent of the total population, to the nearest $\frac{1}{2}\%$, is represented in the Middle Atlantic group? What per cent of the retail buying is represented by this same group?

4. What per cent of the population is represented by the Pacific Coast group? What per cent of the retail buying is represented by this same group?



5. The East North Central group of states has about 20% of the population of the United States and about 21.5% of the retail buying. Does this mean that per capita (per person) retail buying in the East North Central states is higher or lower than in the South Atlantic states? Explain.

6. Complete this sentence: In the regions where the per cent of the population is higher than the per cent of retail buying, the per capita retail buying is ? (higher, lower) than it is in regions where the per cent of population is lower than the per cent of retail buying. Explain.

7. In rural sections much of the food a family consumes is produced by the family. In urban sections much of the food a family consumes must be bought in the retail market. Do you think this fact may explain part of the differences between per cent of population and per cent of retail buying which you observe among the regions represented in these two graphs? Explain.

D. These data are taken from a survey made by the U. S. Department of Agriculture. Meat takes, on the average, about 25% of the food budget of city families. Fish, eggs, and poultry account for an additional 10%. Vegetables and fruits take a fifth and dairy products another fifth.

The part of a city family's income spent for food varies greatly with income. On the average, when a city family has an income of less than $1000 a year, about $\frac{3}{4}$ of it must go for food. When a city family's income reaches $7500, only about 17% must go for food.

City families buy more beef than any other meat. The average city family uses a little over 3 pounds of beef a week or about 15 ounces per person.

1. May you conclude from the above data that the average size of a city family is about 3.2 persons? Do you think this average is larger now than 10 years ago? Why?

2. Assume a city family with an income of $7500. According to the U. S. Department of Agriculture survey, how much of this income is spent for food? How much of this family's expenditures for food are used to buy meat? to buy fish, eggs, and poultry?

3. Do you think you could use these data to make a good estimate of what per cent of a city family's income would be spent for food if the total income were $5000? if it were $10,000? Explain.

4. Assume weekly food expenditures of $30 for a city family. Assume also that 25% of this or _?_ will be spent for meat and 10% or _?_ for fish, eggs, and poultry. Use prices prevailing in your community and decide what purchases you would make with this money for meat and in what amounts.

5. After meat, fish, eggs, poultry, vegetables, fruits, and dairy products have been purchased, what per cent of the food money of a city family is left? What are some other foods for which this is likely to be used?

6. How would you obtain data comparable to that given in the paragraphs above for rural families?

Final Test on Unit I

PART I: COLLECTING DATA

You are faced with the following question: *Are the students in mathematics section A as good computers as the students in section B of the same course?* Below and on the next page are twelve statements of facts which may or may not be helpful in answering the question. Obviously, no single statement can contain enough information to enable you to make a final conclusion, but you are to decide whether the statement contains usable data, and if not, why.

On a work sheet, which you have numbered from 1 to 12, score the statements by one or more of the following letters:

(*a*) if it contains data which are not representative.
(*b*) if it contains data which are not comparable.
(*c*) if it contains data which are not relevant.
(*d*) if it contains data which are representative, comparable, and relevant.
(*e*) need more information to decide whether information is usable.

1. There are more students in section A than in section B.

2. Both sections took the same computation test at the beginning of the course, and section A had a higher average score than section B.

3. There were two students in section A and none in section B who made perfect scores on the computation test.

4. There are more students transferred from other schools in section A than in section B.

5. There are more students in section A than in section B from Eastern Elementary School.

6. Regularly, the students in section A work correctly more problems using computation than do the students in section B.

7. The two sections have just taken the same test on computation. The average scores were: section A, 63; and section B, 61.

8. There were as many students in section A who computed with 80 per cent accuracy on the test (in 7) as there were students in section B who computed with only 20 per cent accuracy.

9. The range of scores on the computation test (in 7) in section A was 15 to 100; in section B the range was 33 to 95.

10. The pupils in section B did no better on a midsemester computation test than the pupils in section A did on the computation test at the beginning of the course.

11. The average number of problems worked correctly on the computation test by section A at the beginning of the course was 63. In section B the average for the midsemester test was only 58 per cent of the total possible score.

12. Section A is better on computation with decimals than section B.

PART II: PRESENTING DATA AND FINDING AVERAGES

1. Here are the strike-out records of 40 National League pitchers:

7	30	73	41	58	33	80	38	58	23
11	40	28	55	26	83	49	32	25	77
5	38	40	64	64	40	30	15	60	54
2	18	85	11	104	49	57	29	25	33

(*a*) Find the mean (whole number).
(*b*) Arrange in rank order.
(*c*) Find the median.
(*d*) Find the mode.
(*e*) Arrange in a frequency table with class interval of 10.

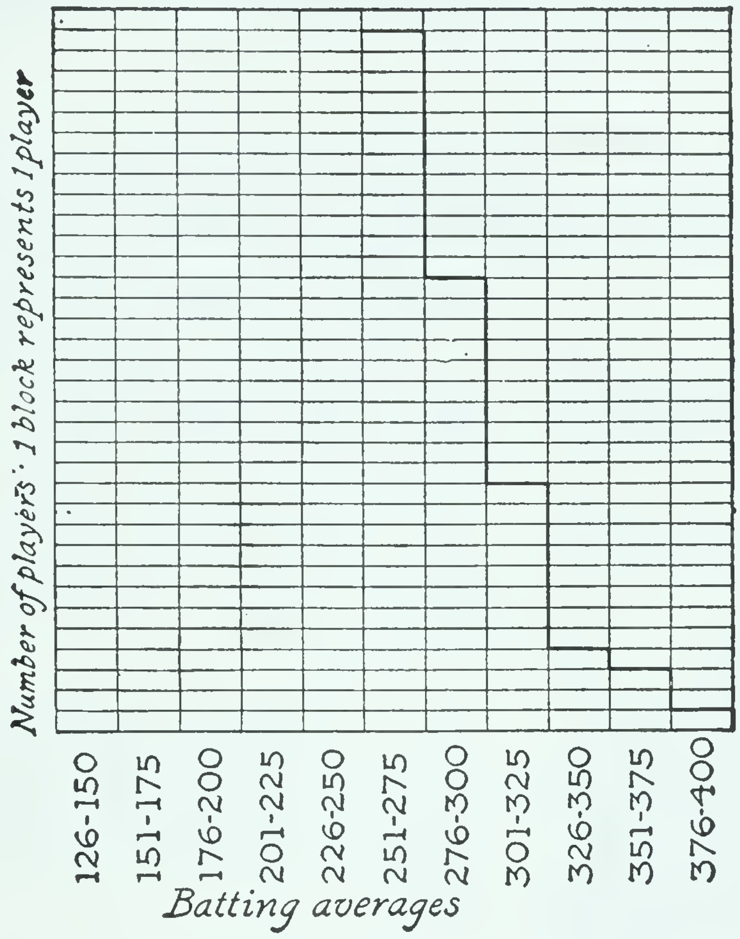
2. The town of Middleboro can call on 335 women volunteer Red Cross workers. Here is a grouped frequency distribution of their ages.

AGE	FREQUENCY
32–34	21
29–31	74
26–28	114
23–25	93
20–22	33

(*a*) What was the mean age?
(*b*) What was the median age?
(*c*) In what interval does the mode appear?
(*d*) Construct a histogram based on this distribution.

3. Here is part of a graph showing the batting averages in the American League. What would the frequencies have to be in the intervals not graphed in order for the graph to approximate a normal curve?

BATTING AVERAGES — AMERICAN LEAGUE



4. What kind of graph would you use to present data for each of the following situations?

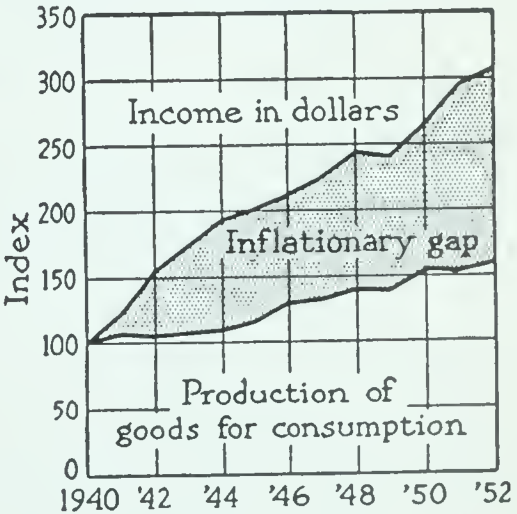
(*a*) Percentages of the various ingredients in milk

(*b*) Yearly production of airplanes for the last ten years

(*c*) Your yearly height from birth

5. Here is a graph picturing in terms of index numbers the amount of income and production of consumer goods in this country over a twelve-year period. What base is used for the graph? In 1952 the income was about how many times as great as in 1940? The production of consumer goods was about how many times as great in 1952 as in 1940? What explanation does this graph suggest for the high cost of consumer goods in 1952?

INCOME AND PRODUCTION OF CONSUMER GOODS IN THE UNITED STATES



The Richmond Times-Dispatch

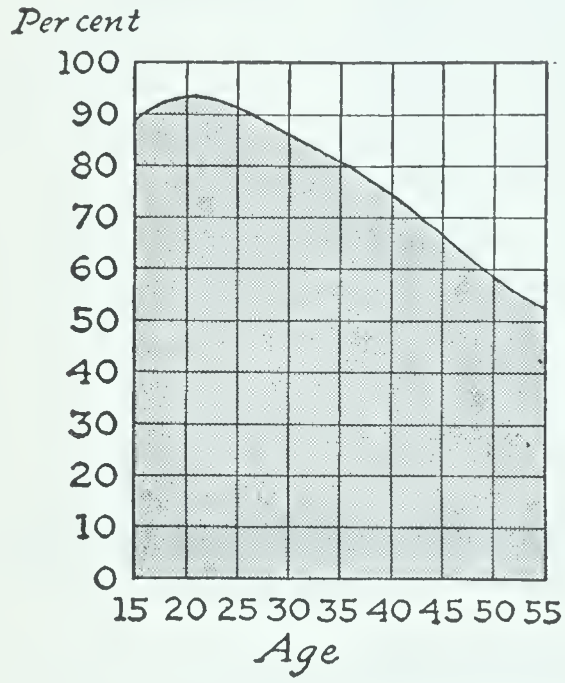
PART III: INTERPRETING DATA

A survey of the use of cosmetics gave the graph shown below.[1] It indicates how the use of lipstick varies with the age of women. Assume this is a true and accurate graph. Then decide which of the nine conclusions given below can be accurately drawn from the information shown.

1. Many more young women use lipstick than do older women.

2. There is a definite increase in the per cent of women using lipstick between the ages of 15 and 22.

PER CENT OF WOMEN AGES 15–55 WHO USE LIPSTICK



3. Girls use lipstick in large numbers before high school age.

4. There is a continuous increase in the per cent of women using lipstick from age 22 to age 55.

5. The mode of this graph is at about age 30 if we assume the same number of women in the survey at each age represented.

6. If this graph were extended above age 55, there would probably be an increase in the per cent of women using lipstick.

7. This graph indicates that manufacturers of lipstick should advertise extensively in magazines read by young women.

8. Lipstick is used by more college girls than high school girls.

9. A larger per cent of single women than of married women use lipstick.

---

[1] "Ninth Survey of Beauty," *Modern Magazine*, 149 Madison Avenue, New York, N. Y.

IMPROVING YOUR ABILITY TO COMPUTE

You are, no doubt, well aware that it is important for you to be able to compute accurately and with reasonable speed. There are many situations, not only in school but also in industry and business of every kind, where the person who does not have this skill is badly handicapped.[1]

In this book there is an efficient program of testing and practice which is designed to help you become a first-class computer. If you take the Inventory and Practice Tests according to the instructions, you should have no trouble with the fundamental operations of arithmetic. Many students like you have used similar tests with great success.

You will like particularly one feature of this plan for making you a good computer — you work on a Practice Test only if you really *need* to. If you are already a good computer, you will spend less than an hour on the whole testing program in this book. You won't waste time practicing something you already know. Here in general is the plan: At the ends of units are Inventory Tests which make it possible for you to check yourself on *groups* of skills in computation. In case you have difficulty with an Inventory Test, you turn to the corresponding Practice Tests near the end of the book. Then, after sufficient practice, you again take the Inventory Test to determine your progress.

The details of the plan and the directions will be given you at the places where you need them. In many of the tests you can write the answers on a strip of folded paper placed beside a column or below a row of examples; but for some tests you will find it necessary to copy the examples before you start the computations. Also you should keep a record of your work in your notebook. A sample form for recording the results of the tests is shown on page 403, along with an explanation of the procedure for keeping the record.

[1] TO THE TEACHER. Research has clearly shown that a program for building and maintaining skill in computation such as that included in this book is of great value. Without it we cannot be sure that our students can compute satisfactorily in situations which they must face after leaving school. Here are our suggestions for using the series of tests: (1) Start students at the same time and allow exactly 4 minutes for each test. (2) Have students score their own work by referring to the answers in the back of the book. (3) Give the tests at the beginnings of class periods. (4) Use students' questions as opportunities to teach *type errors.* The time given to this should be brief. (5) Let students work at whatever point they have reached. Anyone may practice "unofficially" on Practice Tests at home or in study periods. (6) Make certain in the use of this material that the emphasis is on instruction, on improvement of skill — not on testing.

COMPUTING WITH WHOLE NUMBERS

Inventory Test 1: Addition of Whole Numbers

If you pass this test, you probably are good enough in addition for all ordinary purposes. You do not pass if you make more than one error. The last two examples must be correct. Use a folded strip of paper for your answers. *Do not write in your book. Time, 4 minutes.* Add:

7	6	5	8	7	6	9	5	4	8
8	9	6	9	0	8	6	7	9	6

9	8	7	6	8	6	7	5	9	7
7	8	5	4	7	5	9	8	9	6

27 + 6 = 66 + 8 = 49 + 6 = 27 + 6 = 38 + 7 =

57 + 9 = 26 + 6 = 19 + 8 = 57 + 6 = 78 + 7 =

3	3	7	5	493	2583
8	6	2	6	267	977
5	3	8	4	728	28
2	7	9	7	986	47236
9	4	9	9	314	57
6	9	3	2	229	
8	5	6	5	154	

The answers are on page 422, but do not turn to them until your teacher says "Stop." Any example omitted counts as an error. If you passed this test, you next take Inventory Test 2 below. If you failed, you should take Practice Tests 1 A to 1 D on pages 404 and 405. Read page 403 and remember to keep your record.

Inventory Test 2: Multiplication of Whole Numbers

Time, 4 minutes. Multiply.

8	4	0	7	9	8	6	7	9	0	(10)
6	9	9	5	9	4	0	4	7	8	

4	0	7	7	3	8	5	9	6	8	(20)
7	3	6	0	8	8	7	8	9	9	

(Continued on page 85)

60	406	703	506	600
700	60	50	78	700

490	604	440	2898
50	37	56	57

For answers see page 422. If you passed, take Inventory Test 3 next. If you had more than one error, turn to Practice Tests 2 A and 2 B on pages 405–406.

Inventory Test 3: Subtraction of Whole Numbers

Write the remainder only on folded paper. Time, 4 minutes.
Subtract:

13	12	16	15	9	12	13	16	15	14	(10)
8	5	9	8	3	9	7	8	6	9	

8	14	7	11	14	6	12	15	17	13	(20)
0	8	2	7	6	0	8	7	9	5	

14	17	15	7	13	18	16	8	10	11	(30)
7	8	9	7	4	9	7	3	7	4	

67	38	96	607	208	632	963
8	27	53	65	19	26	406

293	600	1000	(40)	400	46230
134	42	604		353	28056

963846	178946	463594	262983
234567	89635	70826	98306

See answers on page 422. If you missed more than one answer, turn to Practice Tests 3 A and 3 B on pages 406–407.

Inventory Test 4: Division of Whole Numbers

Time, 4 minutes. Divide:

$9\overline{)63}$ $6\overline{)36}$ $4\overline{)28}$ $8\overline{)32}$ $6\overline{)48}$ $7\overline{)0}$

$8\overline{)56}$ $7\overline{)49}$ $3\overline{)18}$ $7\overline{)56}$ (10) $9\overline{)45}$ $8\overline{)8}$

$6\overline{)36}$ $9\overline{)54}$ $4\overline{)36}$ $6\overline{)0}$ $8\overline{)48}$ $6\overline{)54}$

$9\overline{)72}$ $1\overline{)0}$ (20) $6\overline{)458}$ $4\overline{)233}$ $9\overline{)360}$ $7\overline{)322}$

$7\overline{)507}$ $8\overline{)466}$ $84\overline{)2022}$ $73\overline{)4396}$

$47\overline{)2961}$ $59\overline{)3304}$ (30) $28\overline{)1802}$ $51\overline{)1581}$

For answers see page 422. If you missed more than one answer, turn to Practice Tests 4 A and 4 B on page 407.

UNIT II

Better Buymanship

Stretching the Dollar on Major Items

Of course there is no such thing as an average family. But the Bureau of Labor Statistics has found that the average number of people in an American family is 3.6. Ordinarily, there is but one earner in a family, and his approximate income for any one year is known at the beginning of that year. How best to use that income to keep the members of the family in good health and to promote their general welfare is a major problem. For most households it means *better buymanship* — a knowledge of how to get the most of both quality and quantity for the least expenditure.

About 68% of the average family income (exclusive of taxes) is spent for three major items: food, 33%; shelter, 25%; and clothing, 10%. The remaining 32% is used for all other expenses, such as owning and operating an automobile, recreation, household furnishings, medical care, operation of the household, transportation, personal expenses, and gifts. Where the family income is below the average, a larger share must be used for food and shelter; and in the very low income brackets there is relatively little money for anything else. Even where the family income is well above the average, food, shelter, and clothing are major items of expense.

Since food, shelter, and clothing represent such a large part of a family's expense, considerable care and judgment should be exercised in the selection of these items. Here are the places for real economy — places to save money that can be used for those little luxuries which make living more enjoyable.

There is no cut-and-dried rule which can be followed by a family in making the best use of income. Each individual is faced with a different problem. But there are some over-all guiding principles that can be used to help in practically every circumstance. For example, it is important to know that high price alone is not a guarantee of good quality, a balanced budget means planning ahead, a bargain sale does not necessarily mean a *real* bargain, the eating of great quantities of expensive food may not fulfill nutritional demands, and weights and labels on food and clothing can give you valuable factual information about products. Better buymanship means getting more good-quality materials, better living conditions, and more good, nutritional food at a price that you can afford to pay.

PROBLEM I

How Can You Save Money on Food?[1]

Food is one of the larger items of family expense regardless of income. In the lower and middle income groups the amount spent for food must be kept within rather narrow limits. But proper food in sufficient amounts is essential to good health. How, then, can you stretch the dollar when buying food? Can you think of ways in which it is possible to save money without decreasing the amount of food consumed? Have you ever considered the differences in the price of foods with equal nutritional value, the advantages of buying in large quantities or in bulk, the study of printed information on readily available foods, supplementing the food supply by means of a garden, or carefully checking the itemized list of the cost of the various items purchased? Any or all of these may influence the amount of money used for food.

Inexpensive foods may have as much nutritional value as expensive ones.

Meat usually takes a large part of the family's food money. This item in the food budget may be reduced by wise buying and skillful cooking. Many low-cost cuts may be made both appetizing and nutritive. Beef liver is considered to have approximately the same food value as calves liver, and yet is much cheaper. Braising the beef liver will make it tender. Likewise, the mother who serves stewed chicken with mashed potatoes or rice on Sunday is giving her family as much food value as the mother who buys a younger and more expensive chicken and serves it roasted, with oyster or chestnut dressing. Can you think of other illustrations?

Several members of the Jones family are "fussy" eaters and like only a few kinds of food. Mother Jones finds it difficult to provide food at low cost. Why? How may dislike of some foods be overcome?

The members of the Durfee family have good appetites; they eat with zest nearly every kind of food that is set before them. Mrs. Durfee realizes that she is fortunate. She can consult certain printed guides that help her to select freely from among many inexpensive and yet nourishing foods. A sample of one type of useful guide is shown below. Can you explain how one would go about using such a guide as a check on his family's food consumption?

---

[1] To the Teacher. Food prices are extremely variable. If the food prices in this problem are not comparable to those in your community at the time this material is taught, you may wish to let the students substitute local prices.

Suggested Weekly Amounts of Food for a Family of Four

(2 moderately active adults, a boy 10, and a girl 8)[1]

What to Include	Amounts for a		
	Liberal Diet	Moderate Cost, Adequate Diet	Minimum Cost, Adequate Diet
1. Milk:			
Fluid milk or corresponding quantities of canned or dried milk, or cheese	21 qt.	21 qt.	17½ qt.
2. Vegetables and fruits:			
Potatoes and sweet potatoes	9 lb.	10 lb.	11 lb.
Tomatoes (fresh or canned), citrus fruit	9 lb.	7 lb.	4 lb.
Leafy, green and yellow vegetables	10 lb.	8 lb.	7 lb.
Dried beans and peas, peanut butter and nuts	½ lb.	1 lb.	2 lb.
Dried fruits	1 lb.	2 lb.	1½ lb.
Other vegetables and fruits	26 lb.	15 lb.	7 lb.
3. Eggs	2⅓ doz.	1⅓ doz.	1⅓ doz.
4. Lean meat, poultry, and fish	11 lb.	7 lb.	4½ lb.
5. Flour and cereals:			
Flour, corn meal, rice, macaroni, spaghetti, and assorted breakfast cereals, as well as corresponding quantities of white and whole-grain breads, other bakery goods, and crackers	7 lb.	11 lb.	15 lb.
6. Fats:			
Butter, margarines, lard, oil, vegetable shortenings, salt pork, and bacon	3¼ lb.	3 lb.	3¼ lb.
7. Sugars:			
Sugar, jellies, jams, honey, sirups, and molasses	3 lb.	3 lb.	3¼ lb.
8. Accessories:			
Coffee, tea, cocoa, baking powder, soda, vinegar, salt, spices, etc.	80 cents' worth	60 cents' worth	45 cents' worth

---

[1] Taken from "Diets to Fit the Family Income," U. S. Department of Agriculture, Farmers' Bulletin No. 1757.

Questions to Discuss and Things to Do

1. Seventeen ounces of evaporated milk are approximately equal in food value to one quart of fluid whole-milk. If evaporated milk sells at 15 cents per 13-oz. can and fluid whole-milk at 25 cents per quart, how much cheaper (to the nearest whole cent) are 17 oz. of evaporated milk than 1 quart of fluid whole-milk?

2. Read carefully the following five statements about fruits and vegetables:

(*a*) Fresh fruits and vegetables are composed largely of water, and therefore they are low in fuel value.

(*b*) But fruits and vegetables contain minerals and vitamins which are necessary for good health.

(*c*) For this reason we cannot afford to substitute cheaper foods simply because such substitutes are high in fuel value.

(*d*) One of the vitamins (vitamin C) found in fruits and vegetables is destroyed by heat, except where it occurs in acid foods.

(*e*) Tomatoes contain vitamin C and are acid. Therefore, tomatoes will provide vitamin C even when cooked.

If you understand the preceding statements, you probably will see why it is desirable to compare prices of tomatoes and oranges. Assume that you are trying to provide the 9 lb. of "tomatoes or citrus fruits" suggested in the "liberal diet." Can you save anything by buying fresh oranges at 5 lb. for 49 cents instead of canned tomatoes at 18 cents per can of 20 ounces? If so, how much (to the next larger whole cent)?

3. The following two lists of vegetables and fruits contain similar food values. Find the total cost of the items in each list. Which list is cheaper? How much?

(*a*) 6 lb. broccoli @ 23¢ ____
6 lb. Brussels sprouts @ 24¢ ____
3 bunches asparagus @ 55¢ ____
3 lb. limas @ 2 lb. for 45¢ ____
6 lb. pears @ 2 lb. for 33¢ ____
6 lb. grapes @ 2 lb. for 35¢ ____
Total ____

(*b*) 4 lb. kale @ $9\frac{1}{2}$¢ ____
4 lb. cabbage @ $6\frac{1}{2}$¢ ____
4 lb. carrots @ 10¢ ____
3 lb. onions @ 10¢ ____
10 lb. potatoes @ 6¢ ____
12 lb. apples @ 13¢ ____
Total ____

4. Eggs, milk, lean meat, poultry, and fish are all good protein (muscle-building) foods. They also provide energy, aid digestion, and supply some of the important minerals and vitamins. These foods are fairly expensive, but they should be included in the diet. Wise buying helps to reduce the cost.

The following two orders of meats and fish contain about the same food value. Compare the costs.

(*a*) $4\frac{3}{4}$ lb. prime roast of beef @ 86¢	____	(*b*) $2\frac{1}{2}$ lb. ground meat @ 47¢	____
3 lb. T-bone steak @ 92¢	____	$2\frac{1}{2}$ lb. shoulder chops @ 43¢	____
$4\frac{1}{2}$ lb. leg of lamb @ 76¢	____	$2\frac{3}{4}$ lb. beef liver @ 69¢	____
$3\frac{1}{2}$ lb. boneless roast of veal @ 74¢	____	$1\frac{1}{2}$ lb. beef kidneys @ 29¢	____
2 lb. fresh fish @ 35¢	____	$3\frac{1}{4}$ lb. stew meat @ 30¢	____
$1\frac{1}{2}$ lb. ham @ 73¢	____	3 cans (15 oz.) mackerel @ 20¢	____
Total cost	____	Total cost	____

5. Use the weekly amounts suggested under "Moderate Cost, Adequate Diet," page 90, and find out how much a family of four can save in a week by careful buying of food at prices charged in your community. You may use advertisements in the local papers for determining prices. Assume in one case that the family buys expensive foods, and in a second case that the family buys inexpensive foods with about the same food value. Decide on some way of dividing the job among members of the class. When all the information has been collected, pool the findings to get the complete picture.

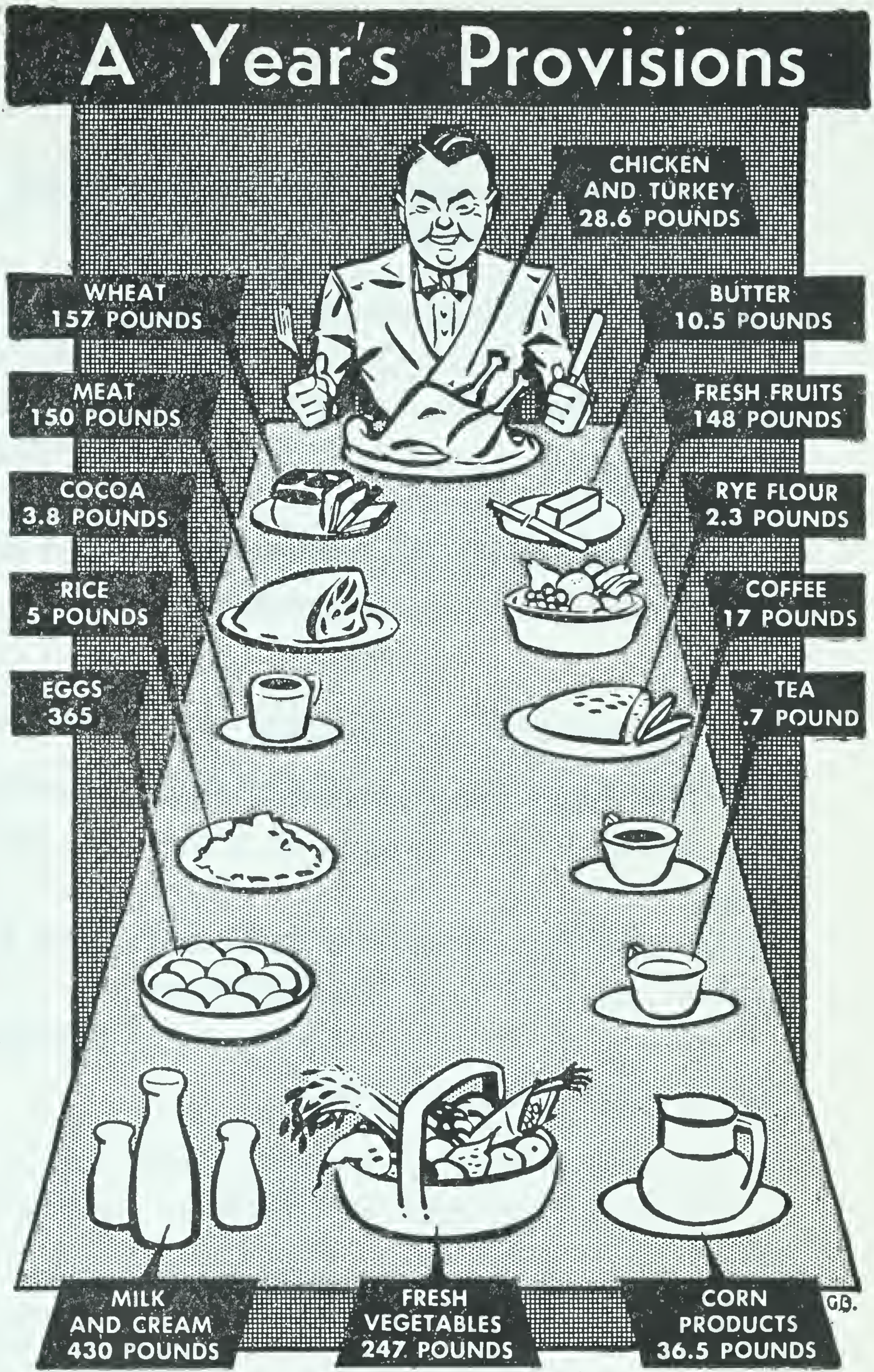
Here is how your record for *Lean meat, poultry, and fish* might look:

EXPENSIVE FOODS		INEXPENSIVE FOODS	
$2\frac{1}{4}$ lb. T-bone steak @ 93¢	$2.10[1]	3 lb. ground beef @ 47¢	$1.41
1 lb. fresh crab meat @ $1.20	1.20	2 lb. shoulder chops @ 45¢	.90
$3\frac{3}{4}$ lb. prime rib roast @ 86¢	3.23	2 lb. salt fish @ 25¢	.50
Total for 7 lb.	____	Total for 7 lb.	____

6. Cold-storage eggs have just as much food value as fresh eggs. Mrs. Allen knows this and always buys cold-storage eggs, which are on the average 5 cents a dozen cheaper. How much does she save in this way in a year on the 2 dozen eggs a week which she uses?

---

[1] Remember that the grocer always counts a fraction of a cent as a whole. Here $2\frac{1}{4}$ lb. at 93¢ equals $2.10.


A Year's Provisions
CHICKEN AND TURKEY 28.6 POUNDS
WHEAT 157 POUNDS
BUTTER 10.5 POUNDS
MEAT 150 POUNDS
FRESH FRUITS 148 POUNDS
COCOA 3.8 POUNDS
RYE FLOUR 2.3 POUNDS
RICE 5 POUNDS
COFFEE 17 POUNDS
EGGS 365
TEA .7 POUND
MILK AND CREAM 430 POUNDS
FRESH VEGETABLES 247 POUNDS
CORN PRODUCTS 36.5 POUNDS

An AP Newsfeatures Pictograph

Based on total consumption of food and total population, the amounts shown here represent the food consumed by the average American in one year. Use the retail prices in your local grocery and market to determine the approximate yearly cost of food for the average American. (Use average prices for meats, fresh vegetables, and fruits in season.)

7. Once more turn to the table on page 90, but this time compare the costs of the foods under "Liberal Diet" and "Minimum Cost, Adequate Diet." Make your own selection wherever the diet permits a choice. Use the prices charged at any local grocery, and use the same foods for both diets. Decide on some way of dividing the job among members of the class. When the information has been collected, pool their findings as was done in Ex. 5.

For milk your record might look like this:

LIBERAL DIET	MINIMUM COST, ADEQUATE DIET
21 qt. fluid milk @ 25¢ = \$5.25	$17\frac{1}{2}$ qt. fluid milk @ 25¢ = \$4.38

Much may be saved by buying food in large quantities.

In many families the food supply is purchased daily and in quantities just sufficient for the day's needs. Usually the procedure means higher costs for foods. With a little planning and a small amount of storage space it is possible to buy in larger quantities at considerable savings.

The following exercises suggest possibilities for stretching the family dollar by buying food in large quantities.[1]

Questions to Discuss and Problems to Solve

1. How much cheaper is salad dressing per ounce when bought in a large jar than when bought in a small jar under the following conditions?

The small jar contains 8 fluid ounces net weight (usually labeled "8 fl. oz. net wt.") and sells for 28 cents.

The large jar contains "1 pint net" and sells for 51 cents. (There are 32 fluid ounces in a quart.)

SOLUTION. 1 pint contains __?__ ounces.
The large jar contains __?__ times as much as the small jar.
1 pint in the small jar = 2 × 28¢ = __?__.
1 pint in the large jar is __?__ cents cheaper.

2. At the local grocery potatoes are priced at 90 cents for a 15-pound bag or $2.70 for a bushel bag. (There are 60 pounds of potatoes in a bushel.) What is the saving in per cent by buying in the larger quantity?

SOLUTION. (Comparison of costs per bushel instead of per pound avoids computing with fractional parts of a cent and saves one step in the work.)
The price per bushel when potatoes are bought in 15-pound quantities is __?__.
The difference in price per bushel is __?__.

---

[1] TO THE TEACHER. The information for these exercises or similar ones might be secured by a field trip to a grocery store. If the field trip seems impractical, the information may perhaps be obtained by an out-of-class assignment. Still another possibility is to make available in the classroom week-end advertisements of grocery stores.

3. A 5-cent-size bar of milk chocolate has a net weight of 1 ounce. The "economy-size" bar weighs 7 ounces and is priced at 2 bars for 45 cents. In 5-cent-size bars, 14 ounces of milk chocolate would cost _?_; in the economy-size bars, 14 ounces would cost _?_. Two bars of milk chocolate of the economy size are _?_ cheaper than 14 ounces of the 5-cent size.

4. The cost of transportation to and from the grocery store may be reduced by buying in large quantities. Here are some data:

A round trip to the grocery store by bus costs 24 cents.

The distance from the grocery store is 2 miles.

The cost of driving the family car is $5\frac{1}{2}$ cents a mile.

Three trips to the grocery store each week can be saved by buying in large quantities.

What is the cost of six trips by bus to the grocery store each week? of six trips in the family car? If buying in large quantities will mean only three trips each week, how much will be saved in bus fares? in the cost of driving the family car?

5. Two possible advantages of buying in large quantities have been suggested: saving on the cost of articles and on the cost of transportation. Can you add to this list of advantages? Can you think of some *disadvantages* of buying in large quantities?

6. Mrs. Ettel buys spinach ready washed and prepared for cooking. She pays 19 cents for a 12-ounce bag. Mrs. Denetti buys spinach unwashed and prepares it at home. She gets 2 pounds for 35 cents. How much cheaper is Mrs. Denetti's spinach than Mrs. Ettel's?

(*a*) One way to answer this question is to find the cost of 12 oz. of spinach at 2 lb. for 35¢. What would this amount be?

(*b*) Another way to answer this question is to find the cost of 2 lb. of spinach at 12 oz. for 19 cents. What is this amount?

(*c*) A third way to answer this question is to find the cost per pound at each price. What are these prices?

(*d*) Which of these three methods do you think gives the best comparison? What is a person really paying for in the more expensive spinach?

7. A glass jar containing one pound of "Savory" coffee costs 90 cents. A pound of the same coffee in a paper bag costs 79 cents a pound. A pound of coffee lasts the Howells about 2 weeks. How much can they save in 52 weeks by buying "Savory" coffee in a bag instead of in a jar?

8. A store advertised a special sale of "Spring Valley Peas" at 2 cans for 39 cents. The regular price of the peas is 23 cents a can. How much can be saved on a dozen cans of peas by buying at the special sale?

9. Before anyone can intelligently read and interpret the weekly advertisements for canned goods in grocery stores, he or she must know about the capacities of the various sizes of cans. This table gives the approximate capacities of common can sizes.

NAME	APPROXIMATE WEIGHT OF CONTENTS	CAPACITY IN CUPS
No. 1	11 oz.	1¼
No. 1½	1 lb.	2
No. 2	1 lb. 5 oz.	2½
No. 2½	1 lb. 15 oz.	3½
No. 10	7 lb.	13

Find the capacities in cups and in ounces of these orders of canned goods:

2 No. 1 cans and 3 No. 2 cans
1 No. 10 can and 4 No. 2½ cans
4 No. 1½ cans and 3 No. 2 cans

10. Two grocery stores advertised these prices on canned goods:

	STORE A		STORE B	
Pork and Beans	No. 2 can	2 for 38¢	11 oz. can	12¢
Peaches	No. 2½ can	33¢	1 lb. can	2 for 31¢
Tomato Juice	No. 10 can	57¢	1 lb. 15 oz. can	17¢

Decide which store had the lower unit price for each product.

11.* How much could a family of four in your community save by buying food in large quantities? For the project use the information given under the heading, "Moderate Cost, Adequate Diet," in the table on page 90. The class selects the foods it will pretend to buy from each of the eight kinds, and they use the prices at a local grocery store to find the cost of buying these foods in small and in large quantities. It will be well to divide the work among members of the class. When all the information has been collected, pool the findings in class. Then each student should work out the answer separately.

12.* The amount saved on individual purchases may seem small, but how about the amount a family of four can save in a year by buying food in large quantities?

Assume that the family has been spending about $20 a week for food, which is purchased almost entirely in small amounts by daily trips to the stores. About half the food supply may be bought in either small or large quantities.

On the basis of the earlier work in this unit, you should be able to make an estimate of the probable saving in per cent which would result from buying in large quantities. Try it. How much less money would the family spend for the year's food supply? (The answers to the preceding problems will be useful here.)

Household expenses may be reduced by buying at the right time.

In shopping for the home the intelligent buyer makes use of good consumer reports on the quality and price of products he needs to purchase. In the typical newspaper of a large city such a report appears each day under a heading like "The Shopper's Guide" or "News of Food." The best food buys of the day are listed in these guides. The plentiful vegetables, fruits, and meats and their current prices are listed in the guide. In some cities, daily morning radio broadcasts give data on available foods in various stores. When products are plentiful, prices are lower.

Other consumer guides are available for comparing values in fresh and frozen foods and canned and packaged foods.

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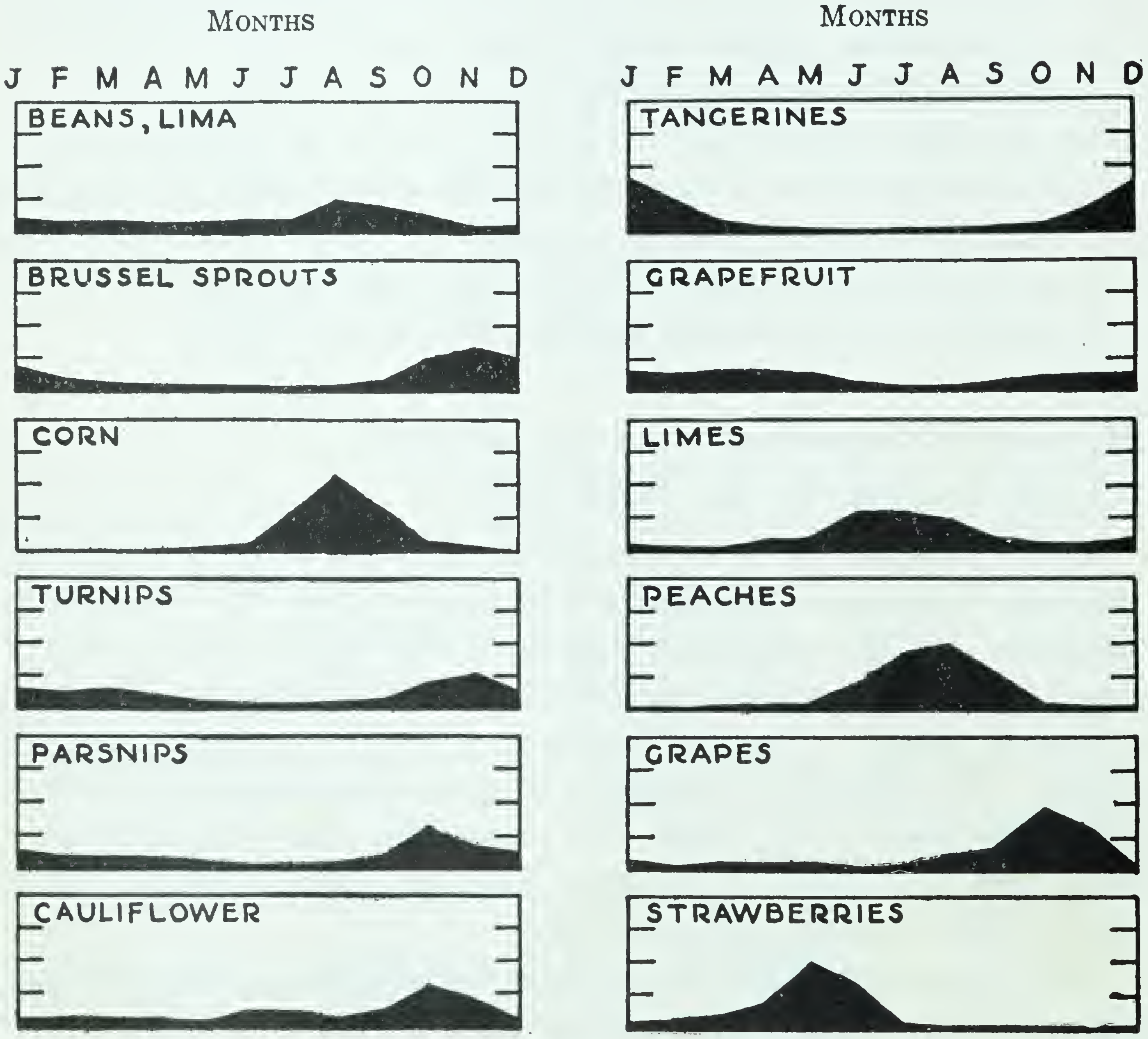
* All starred topics are optional and may be used at the discretion of the teacher.

Questions to Discuss and Problems to Solve

v **1.** Mrs. Howell had planned to include in a dinner menu a stew and a green vegetable. She found in a shopper's guide, under "buys" for the day, that stewing lamb was 41¢ a pound and spinach was 14¢ a pound. How much would 2 pounds of lamb and 2 pounds of spinach cost?

At the store she was told that stewing beef was 45¢ a pound and string beans were 21¢ a pound that day. How much would 2 pounds of beef and 2 pounds of string beans cost? How much would she save by using the "buys" of the day?

SEASONS WHEN SELECTED FRESH VEGETABLES AND FRESH FRUITS ARE PLENTIFUL[1]



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[1] Source: *Consumers' Guide.* Based on truck, boat, and train shipment into New York.

2. Mrs. Howell also found from her shopping guide that the toilet soap she had been using was costing her $1.40 for 12 cakes. She learned that another equally good toilet soap sells for only $1.00 for 12 cakes. If the Howells use 36 cakes of toilet soap a year, how much can they save by changing to the less expensive brand of soap?

3. Look at the graphs of shipments of fresh fruits and vegetables on the opposite page. When do you think tangerines are the cheapest in the New York area? When would you buy corn and lima beans in that locality?

4. Mrs. Rinetti figures that she can save further on plentiful foods by renting a frozen-foods locker for a year. Here is how her calculations worked out:

EXPENSES

12 months locker rent	$12.00
Quick freeze charge on 250 pounds @ 2¢	= 500
83 small-size containers @ 3½¢	= 291
80 large-size containers @ 5¢	= 400
33 pounds chickens @ 45¢	= 1485
28 pounds pork @ 43¢	= 1204
50 pounds peaches @ 6¢	= 300
	5380
15 pounds spinach @ 10¢	= 150
20 pounds green peas @ 15¢	= 300
37 pounds carrots @ 8¢	= 296
40 pounds string beans @ 10¢	= 400
27 pounds broccoli @ 18¢	= 486
Fuel for blanching vegetables	$2.75
Total	= 22.87

VALUE OF 250 POUNDS FROZEN FOOD AT OFF–SEASON PRICES FOR FRESH MEATS AND VEGETABLES

33 pounds chickens @ 55¢	= 1815
28 pounds pork @ 53¢	= 1484
50 pounds peaches (canned) @ 18¢	= 900
15 pounds spinach @ 15¢	= 225
	4424
	22[illegible]
20 pounds green peas @ 24¢	= 480
37 pounds carrots @ 12¢	= 444
40 pounds string beans @ 15¢	= 600
27 pounds broccoli @ 27¢	= 729
Total	= 6677

Does Mrs. Rinetti save or lose on foods by buying plentiful foods when the prices are low, and renting a freezing locker, instead of buying fresh foods at higher prices? How much? 6.20

*Special investigation**

If any students in the class have food freezers in their homes, ask them to get estimates from their parents on the effect the freezers have on food costs.

A garden helps with the food budget.

Mr. Nelson thought he could save some money if he and his son James raised some of the vegetables for the family table. James got permission for the use of a small vacant lot near their house. They cleaned the lot of weeds and rubbish and then paid to have it plowed. At the outset of their work Mr. Nelson suggested that they keep account of all the costs (other than their own time) and later on compute the value of the vegetables they grew. If you will do the computations which James did, you will find how much the Nelsons' garden affected the food costs in their budget.

Questions to Discuss and Problems to Solve

1. Two bags of fertilizer at $2.75 a bag and $\frac{3}{4}$ of an hour of plowing at $3.00 an hour were the first cost for the Nelsons' garden.

2. James's record showed these purchases of seeds:

3 lb. green peas @ 45¢
$1\frac{1}{2}$ lb. green beans @ 65¢
$\frac{3}{4}$ lb. baby lima beans @ 75¢
$1\frac{1}{2}$ oz. beet seeds @ 40¢
2 doz. cabbage plants @ 25¢ a doz.
3 oz. of radish @ 49¢ per quarter pound
2 packages onion seed @ 15¢
1 package Swiss chard @ 10¢
1 package squash @ 10¢
$\frac{1}{2}$ lb. Golden Bantam sweet corn @ 60¢
$\frac{1}{2}$ lb. hybrid sweet corn @ 90¢
3 packages carrots @ 15¢
1 package cucumbers @ 10¢
$\frac{1}{4}$ oz. lettuce @ 59¢
12 pepper plants @ 2 for 5¢
6 oz. spinach @ 49¢ per quarter pound
2 doz. tomato plants @ 40¢ per dozen

3. James and his father bought some garden tools: a hand plow or wheel hoe @ $12.65, a rake @ $1.85, a hoe @ $1.89, and a four-pronged rake @ $2.25. Since these would last several seasons, James figured that only $\frac{1}{5}$ of the cost of the tools should be charged to the cost of the garden in any one year.

4. James's father wanted the food for his family and not for the various types of garden pests; so he bought a second-hand sprayer and a few recommended types of insecticides for $6.25.

All together James's account showed their garden cost ?.

5. Mrs. Nelson weighed on her kitchen scales everything she got from the garden. James figured his record should list the vegetables at prices prevailing in the grocery stores, since this is what his mother would have paid for them if they had not had the garden. His record looked like this:

53 pounds of green peas @ 2 lb. for 41¢
147 pounds green beans @ 2 lb. for 39¢
36 pounds lima beans @ 2 lb. for 45¢
51 pounds beets @ 10¢
28 pounds cabbage @ 6¢
19 doz. radishes @ 5¢ doz.
23 pounds onions @ 2 lb. for 19¢
21 pounds Swiss chard @ 2 lb. for 25¢
60 pounds squash @ 2 lb. for 29¢
7 doz. ears sugar corn @ 40¢ per doz.
27 pounds carrots @ 2 lb. for 19¢
$6\frac{1}{2}$ doz. cucumbers @ 45¢ per doz.
3 doz. heads of lettuce @ 2 heads for 39¢
$8\frac{1}{2}$ doz. peppers @ 2 for 8¢
11 pounds spinach @ 2 lb. for 27¢
190 pounds tomatoes @ 3 lb. for 12¢

The value of the vegetables James and his father raised was __?__.

6. Mrs. Nelson didn't want to waste any of the vegetables; so she canned or pickled all that the family couldn't eat while fresh. She figured that the gas heat for canning cost about $1.25; the sugar, salt, vinegar, and spices cost $1.47; the jar lids and rings, $2.20. She had saved jars for several years and did not need to buy new ones. The cost for canning (heat, condiments, and jar accessories) was __?__. James deducted these expenses and the cost found in Ex. 4 from the total value computed in Ex. 5. The difference amounted to __?__. This represented the saving which he figured their garden made in Mrs. Nelson's annual food budget.

7. According to James's figures, the weekly saving on food was __?__. Do you think the saving would have been greater if James had figured the amounts of canned vegetables at prices of canned goods in the local stores?

Harold M. Lambert from Frederic Lewis

Habits of accuracy are valuable in business dealings.

Many persons are careless in business dealings. Have you known persons who do not count their change? Perhaps they pick up the change, and if it "feels about right," pocket it without counting. Do you know persons who do not check the monthly statements issued by banks? Is there someone in your home whose duty it is to check the readings on the various meters? Is it worth while to check grocery orders? Errors may occur in any type of accounts. It is good practice to check them.

Many grocery stores that deliver orders include bills showing the items delivered, the price of each, and the total of the bill. Mrs. Edwards makes a practice of checking these bills very carefully. Here are some in which she has found errors. Can you find them?

Problems to Solve

1.

$1\frac{1}{2}$ lb. bacon @ 59¢	.89
3 dozen eggs @ 79¢	2.37
4 cans soup @ 2 cans for 31¢	.62
2 bunches carrots @ 15¢	.30
2 cans peas @ 2 cans for 51¢	1.02
1 lb. bananas @ 3 lb. for 49¢[1]	.17
2 boxes cereal @ 16¢	.32
$\frac{1}{4}$ lb. cheese @ 69¢	.18
2 loaves bread @ 17¢	.34
2 jars honey @ 32¢	.64
Total	$6.95

2.

$2\frac{1}{4}$ lb. chicken @ 65¢	1.47
3 bunches beets @ 2 for 25¢	.38
1 bunch celery @ 19¢	.19
3 lb. onions @ 4 lb. for 29¢	.22
10 lb. potatoes @ $3\frac{1}{2}$¢	.35
3 doz. oranges @ 2 doz. for 98¢	1.47
3 pkg. cornflakes @ 2 for 45¢	.90
2 lb. butter @ 76¢	1.52
10 lb. sugar @ 5 lb. for 51¢	1.02
4 cans peaches @ 2 for 73¢	1.46
Total	$8.98

3.

1 can sauerkraut @ 2 for 23¢	.12
2 cans baking powder @ 19¢	.38
3 jars jelly @ 16¢	.48
3 lb. cranberries @ 2 for 45¢	.68
2 loaves bread @ 3 for 47¢	.32
5 lb. veal roast @ 83¢	4.15
3 doz. eggs @ 2 doz. for $1.55	2.33
6 cans soup @ 2 for 25¢	1.50
3 lb. cauliflower @ 2 for 39¢	.59
5 lb. grapes @ 2 for 38¢	.95
Total	$11.50

4.

2 cans corn @ 4 for 74¢	.37
6 cans tomato puree @ 3 for 44¢	.88
1 doz. cans baby food @ 3 for 31¢	1.24
1 can corned beef @ 2 for 95¢	.48
1 can spaghetti @ 3 for 37¢	.37
3 pkg. macaroni @ 2 for 29¢	.44
6 bars soap @ 3 for 28¢	.56
1 can evaporated milk @ 2 cans for 29¢	.15
2 lb. coffee @ 85¢	1.70
5 lb. leg of lamb @ 83¢	4.15
Total	$10.34

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[1] To the Teacher. In all grocery purchases the groceryman counts any fraction of a cent as a whole. Here 1 lb. of bananas will cost 17 cents.

Philip Gendreau

PROBLEM II

How Can You Save Money When Buying Clothing?

"Mother! Mother!" Una called excitedly as she replaced the handset on the telephone stand. "That was Jack. He asked me to go to the senior dance with him Friday night! But what shall I wear?"

"Why, your blue evening dress, of course," Mrs. Noons replied. "You've worn it only once and I thought you looked lovely in it."

"But, Mother, have you forgotten that spot I got on it?"

"No, I didn't forget," said Mrs. Noons, "but your dress is due back from the cleaner today. As a matter of fact, there is the cleaner's truck now."

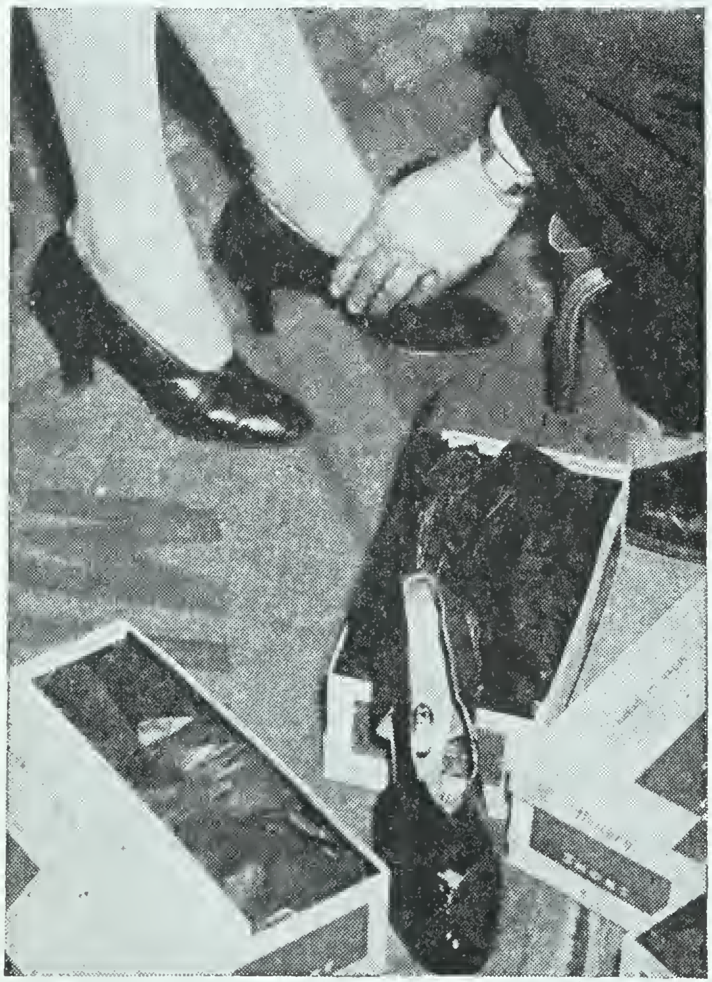
Una could hardly wait to get her hands on the dress. But her face fell when she saw a note from the cleaner explaining that he had not been successful in removing the spot.

Mrs. Noons, not easily disheartened, sent Una upstairs to try on the dress. In a few moments she was down again standing before her mother, and looking like someone just dragged out of the river.

"We'll have to take that dress back!" Mrs. Noons exclaimed. "Miss Davis guaranteed it to have a permanent fit. However, it had far too much finishing material in it. When the cleaner tried to remove the spot, some of the finishing material was removed from the dress, spoiling the texture and permitting the fiber to stretch."

Returning from the dress shop, Una asked, "Mother, how did you ever learn about the finishing material in my dress? If you hadn't known about it, Miss Davis might not have given me a new dress."

"When you children were little," Mrs. Noons replied, "I got a booklet on how to buy children's clothes wisely. I found it so helpful that I have been constantly on the lookout for up-to-date helps in buying clothes for the whole family. I have found that there are many sources of information; for example, I have some good pamphlets from the United States Bureau of Home Economics."



Lass from Frederic Lewis

Comfort is a most important factor in buying shoes.

"Mother, don't you think I ought to know more about buying my own clothes? Sooner or later I'll have to get *some* things by myself."

"Yes, I do; and I am delighted to see you so interested," was Mrs. Noons's answer. "Here are some of the guides I have used in buying clothing. Your father follows them in buying his clothes and I keep them in mind not only when I buy for you, but also when I buy for the boys."

"Wait a minute, Mother," Una interrupted. "Maybe I'd better write down the list of guides."

Here are some guides for buying.

Mrs. Noons thought that was a good idea. "Why not write them on one of these correspondence cards in my desk? Then you can put the card in your purse when you go shopping. And you might list them as *guides for buying,*" Mrs. Noons advised.

Here are the guides Una wrote on the cards:

(*a*) Never buy by price alone. In women's clothes, particularly, price is not always a safe guide to long-wearing or serviceable clothing.

(*b*) If you don't actually need an article, never buy it, even at a bargain sale.

(*c*) Always look at labels. Always look at the weave of the cloth. In general, the closer the weave the more durable will be the cloth.

(*d*) Buy only from merchants who are willing to stand back of the guarantees as labeled on their goods. Then if you find some materials aren't what the labels claimed, you can return the goods and obtain satisfaction.

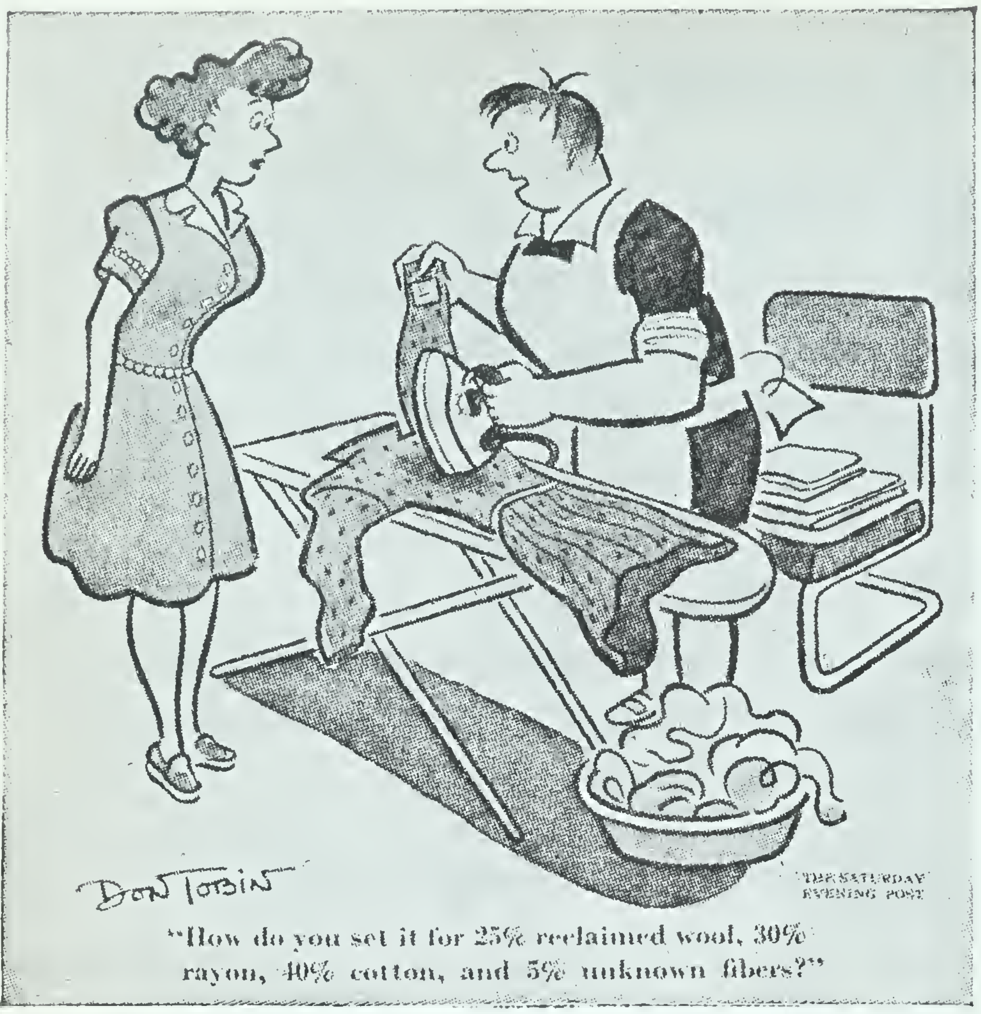
(*e*) Never buy clothes of extreme styles.

(*f*) Always turn a garment on the inner, or seam, side. If the material beyond the seam is skimpy, the garment probably is cheaply made. The way in which a garment is put together is a good indication of the quality of the garment.

(*g*) Watch newspapers for sales of out-of-season items, preinventory merchandise, odd sizes, and irregulars or seconds. If you need clothing, these sales may be real bargains.

(*h*) Always buy by fit and not by size. Ordinarily growing persons should buy clothing of full fit because it will likely give longer service.

(*i*) Be your own judge of what is becoming for you. Sales persons may help but frequently are overpersuasive.



"How do you set it for 25% reclaimed wool, 30% rayon, 40% cotton, and 5% unknown fibers?"

Many modern fabrics consist of several different types of materials. The cartoon shown here indicates a possible mathematical difficulty in the care of such fabrics.

Hearing the clock strike, Mrs. Noons turned quickly to Una. "I'm afraid I'll have to stop now, as I have not bought my groceries for tomorrow. If you want to add to your list of guides for buying clothing, you can look at some of those bulletins in my desk. You'll find suggestions on buying hosiery, furs, sheets, towels, and a lot of other things." [1]

"Thank you a lot, Mother. I believe I will look them over while you are at the grocery store," Una said.

After looking at the bulletins, Una decided to make an inventory of all her items of clothing and to find out the probable annual replacement cost of her complete wardrobe. So she made up a table like the one shown on the opposite page and began to fill in the various articles of wearing apparel.

The first item on Una's list is an overcoat which she remembers cost \$45.00 when new. She has worn the coat for two years and she thinks that she will have to get a new one next year. Hence, she lists the length of service for the overcoat as three years. This makes the yearly replacement cost for her overcoat equal to \$15.00.

Next Una lists 12 handkerchiefs at a cost of 35¢ each. She estimates that she needs only 6 handkerchiefs a year; so the 12 handkerchiefs will serve for two years. Hence her yearly replacement cost for handkerchiefs is 6 × \$.35 = \$2.10.

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[1] To the Teacher. Some students may wish to take as an individual project the working-up of suggestions for wise buying of various other articles of clothing.

MY CLOTHING INVENTORY

ARTICLE OF CLOTHING	ESTIMATED COST	LENGTH OF SERVICE	YEARLY REPLACEMENT COST
Coats, sweaters, and jackets			
Overcoat	$45.00	3 years	$15.00
Suits and dresses			
Shirts, blouses, etc.			
Underclothes and pajamas			
Hosiery			
Shoes, hats, gloves			
Purses, handkerchiefs, etc.			
12 handkerchiefs	35¢ each	2 years	$2.10
Sportswear			
Miscellaneous			

Questions to Discuss and Things to Do

1. Prepare a form like the one started by Una Noons and list all the items in your personal wardrobe. Complete the columns headed "Estimated Cost," "Length of Service," and "Yearly Replacement Cost." What is the total replacement cost of your clothing for one year?

2. Assume that you can reduce your yearly replacement cost by 5% if you buy your clothes more carefully and take proper care of the things you have. How much would you save in a year? If you could reduce the replacement cost by $7\frac{1}{2}$%, what would be the saving in one year?

3. What was wrong with the dress Una took back and exchanged for a new one?

4. What are some general buying guides?

5. Can you add to the list of suggestions which Mrs. Noons gave Una to help her in buying clothing?

6. Make a list of some of the more important things to consider when buying shoes.

Special investigations

7. Have each member of the class obtain a list of ways by which his or her mother saves money when buying clothes. Appoint a small committee to prepare a summary list for the class.

One class in a small town carried out this investigation in an interesting way by making up a list of ten women in the town who were known to be outstanding homemakers. The class then selected ten students as representatives and sent one representative to interview each of these ten women.

8. Clothes that are given proper care last longer and look better. Such care includes mending, brushing, laundering, dry cleaning, and temporary and seasonal storing. A little time spent in finding out about the proper care of clothes may result in a big saving on the annual clothing bill. Divide the class into groups and assign one of the items of care to each group. Have the groups make reports to the class on the things to do and the mistakes to avoid.

The wise housewife knows many ways to reduce the clothing item in the family budget.

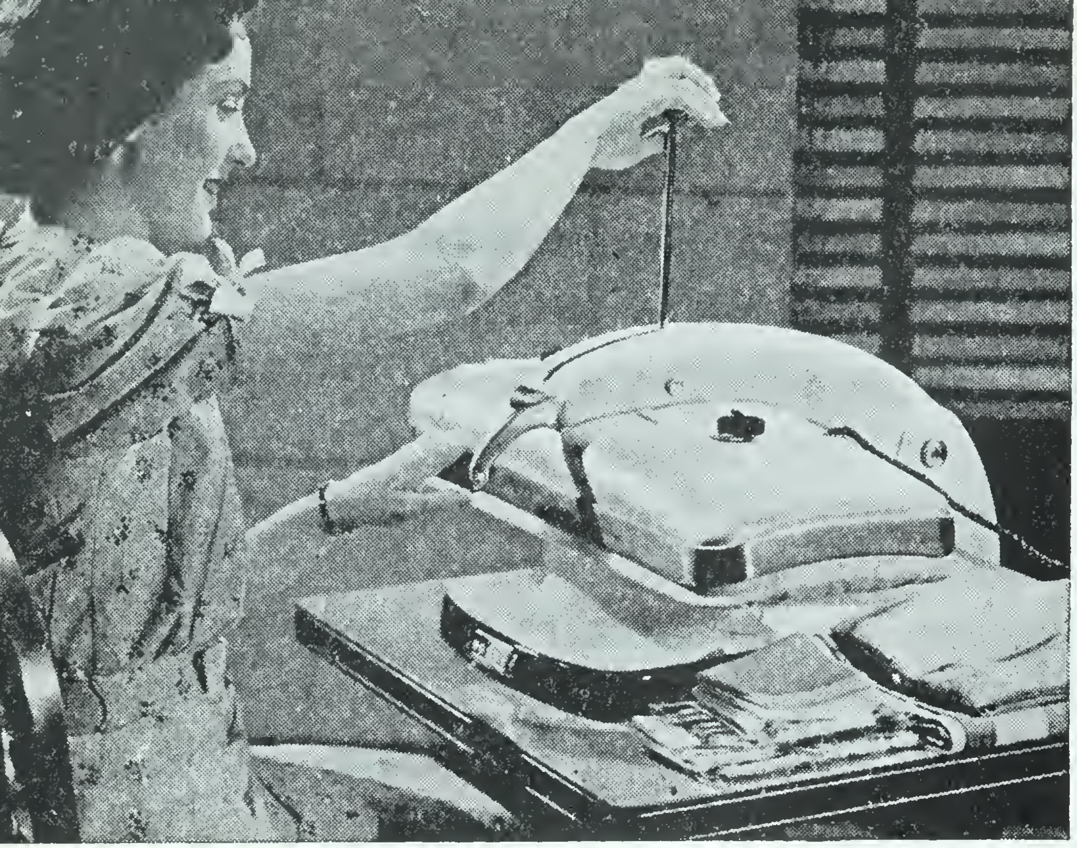
In buying for her family of four, Mrs. Higgins has learned many ways to save on the clothing item in her family's budget. She, Mr. Higgins, and their 15-year-old son and 17-year-old daughter are always neatly dressed. Her neighbors marvel at the way she manages to do this on Mr. Higgins's moderate income. In the exercises that follow, you will learn about Mrs. Higgins's wise buymanship in clothing her family. You will also learn about the buymanship of some of her neighbors.

Problems to Solve

1. Two years ago, Mrs. Higgins bought a dress for herself for $39.50. This year she remodeled the dress, which will now last her two more years. The remodeling cost $2.00 for a collar, $2.00 for a belt, and $1.64 for buttons and thread. At the end of the first two years, how much had the dress cost per year? What was the cost per year at the end of four years?

2. Mrs. Higgins obtained a tip on shoes from an article about Army methods. She now buys two pairs of shoes at a time for James at a cost of $8.25 a pair. By wearing one pair one day and the other pair the next, James finds that a pair of shoes can be worn 25% longer than they could when the same pair was worn every day. How much does this Army plan save on a single pair of James's shoes? On the same basis, how much would Mr. Higgins save on two pairs of shoes for himself at $10.25 a pair? Do you think that the Army plan would result in a saving in the cost of shoes for Mrs. Higgins?

3. In her homemaking class Mary Higgins has learned to make some of her own clothes. In a dress shop recently, she saw a dress that she liked. It was marked $19.95. She was able to make one like it for these costs: pattern 45¢, $3\frac{1}{4}$ yards of material @ $1.83 a yard, collar $2.00, and buttons and thread $1.75. How much cheaper was the dress she made than the ready-made one?



Philip Gendreau

An electric ironer may save both money and time. Perhaps you will like to find out what it costs per year to own and operate such an iron if the original cost is distributed over 8 years.

4. Mrs. Higgins knit James a sweater with 4 skeins of wool at $1.34 a skein. An all-wool ready-made sweater would have cost $10.95. How much did she save by knitting the sweater?

5. Mrs. Higgins's washing machine saves her a great deal on laundry bills, for she washes all the rough clothes for the family. This reduces her laundry bill, on the average, $1.90 a week. How much is this a year?

6. Mrs. Higgins sends the clothes to be finished to the laundry. She finds, however, that for any one week she does not have enough laundry to justify paying the $1.25 minimum charge. So she sends her soiled clothes out every two weeks at an average cost of $1.75 per bundle. How much does she save in a year by sending her laundry every two weeks instead of every week?

7. Mrs. Higgins buys 5-dollar books of tickets at the dry cleaner's for $4.50. This is a _?_% saving. If her annual cleaner's bill was $45.00, without tickets, what would it be with the book of tickets? How much does she save in one year?

8. Both Mrs. Meyers and Mrs. Logan, neighbors of Mrs. Higgins, have two small children. Mrs. Meyers cannot sew and must buy all ready-made clothes for her children. Mrs. Logan makes many things her children wear. Let us see how much more several summer garments cost Mrs. Meyers than the corresponding ones cost Mrs. Logan.

MRS. MEYERS' COSTS

For Lucy: 6 years old

3 dresses @ $3.19
2 dresses @ $3.98
3 pairs pajamas @ $2.12
1 spring coat, $12.98

For Sammy: 2 years old

3 sun suits @ $1.39
2 creepers @ $2.49
1 sweater, $2.89
3 pairs pajamas @ $1.48

MRS. LOGAN'S COSTS

For Jane: $5\frac{1}{2}$ years old

2 dress patterns, 25 cents each
$3\frac{1}{2}$ yd. material @ 45¢
2 yd. material @ 62¢
$4\frac{3}{8}$ yd. material @ 69¢
5 yd. rickrack @ 4¢
$3\frac{1}{2}$ yd. ruffling @ 13¢
$\frac{1}{4}$ yd. material @ 45¢
$8\frac{1}{4}$ yd. material @ 49¢
$1\frac{1}{2}$ yd. coat material @ $3.35
1 pajama pattern, 20¢
1 coat pattern, 25¢
Buttons and thread, $1.50

For Paul: $2\frac{1}{2}$ years old

1 sun suit pattern, 20 cents
$2\frac{1}{4}$ yd. material @ 62¢ a yd.
1 creeper pattern, 25 cents
$3\frac{1}{2}$ yd. material @ 89¢ a yd.
2 balls wool @ 98¢ a ball
1 pajama pattern, 20 cents
$4\frac{1}{2}$ yd. material @ 39¢ a yard
Buttons and thread, 95 cents

9. Mrs. Fleet can buy a part-wool coat at $46.50 or an all-wool coat at $55.00. From her experience she estimates that the part-wool coat would wear 2 years and the all-wool coat would wear 3 years. Which would be cheaper per year of wear? How much?

10. Helen Tyler always buys 2 pairs of stockings at a time. She claims that she gets 75% more wear from her stockings than when she bought only one pair at a time. How do you think she gets the difference in wear? She now uses 8 pairs of stockings a year at $1.69 a pair instead of 14 pairs at the same price. How much does she save in a year?

11.* Mr. Henry can buy socks at 3 pairs for $1.75 or one pair for 75 cents. How much longer would a 75-cent sock have to wear to be as inexpensive as one of the 3 for $1.75 kind?

Buy clothing at the right time.

There are regular consumer guides for comparing values of clothing. The wise buyer can use these guides to learn what points to consider when purchasing articles, such as an overcoat, a pair of shoes, or a radio. And on non-perishable articles there are seasonal sales, which may be used to advantage just as the food specials are.

Problems to Solve

1. How much could be saved on a pair of skates regularly priced at $4.98, but now on sale at 8% discount?

2. Mr. Johnson bought an overcoat in an August pre-season sale. He paid $47.60. The salesman told him the price would advance 25% in 30 days. How much did Mr. Johnson save by buying in August?

3. Mrs. Nelson always watches for the "Spring Special" on laundering blankets. At this special rate, she had 3 single blankets laundered at 89 cents a pair, which cost her ?, and 4 double blankets at 69 cents each, or ?. The total cost was ?. The regular rate is 60 cents each for single blankets and $1.00 each for double blankets. The cost to Mrs. Nelson at the regular rate would be ?. She saved ? by sending her blankets to the laundry when she could get a special rate.

Du Pont Company

Many new types of plastics have entered the field of fashion. One of these is polythene, a lightweight material that is tough, flexible, and rain resistant. The rain cape and hood shown in the illustration are made of polythene.

Textile research is producing improved fabrics.

Scientists have recently produced many new fabrics, and they are constantly striving to produce more. Some of the more familiar fabrics on the market are *aralac,* a fabric made from the casein of skim milk; *fiberglas,* a textile made from very fine glass fibers; *koroseal,* an elastic material made from limestone, coke, and salt; and *nylon,* a textile made from coal, air, and water.

The scientists also have developed coatings and other treatments which tend to make existing fabrics more serviceable, more durable, and more attractive in appearance. Coatings of synthetic resin, synthetic rubber, and a form of cellulose nitrate (pyroxylin) have been used to produce lighter and longer-lasting rainwear, hospital sheeting, and similar articles. And treatments to prevent fabrics from shrinking or cracking have been perfected.

Problems to Solve

1. Wool socks that have been treated to make the wool shrinkproof wear 30% longer than ordinary wool socks. Mr. Wice's ordinary wool socks cost $1.30 a pair and lasted him about 10 weeks. This cost him _?_ cents a week per pair of socks. New shrinkproof wool socks cost $1.50 a pair and would last him _?_ weeks. They would cost him _?_ cents a week per pair (to nearest half cent).

2. A strand of fiberglas may be as fine as 22 one-hundred-thousandths of an inch in diameter. Express this diameter decimally. How many strands placed side by side would measure 1 inch?

3. Aralac is a wool-like fabric. It is frequently blended with wool, cotton, or rayon. If a garment weighs 3 pounds 6 ounces and contains 40% aralac and 60% wool by weight, what is the weight of the aralac? of the wool?

4. Mrs. Keyser has found that nylon curtains can be laundered without the use of stretching frames. Mrs. Keyser says that not having to stretch the curtains saves about $7\frac{1}{2}$ cents per pair on the laundering cost. She estimates that four launderings a year for her 12 pairs of curtains would save _?_ on her annual laundry bill.

Philip Gendreau

Provision for shelter involves many things. It is not merely a question of building, buying, or renting but constitutes a great deal of careful planning and intelligent thinking.

PROBLEM III

What Savings May Be Made When Providing Shelter?

If you rent your house or apartment, the rent must of course be counted in the cost of housing. If you own your house, or are paying for it, there are many expenses that must be considered in computing the cost of shelter. Electricity is one of the items of expense in running most homes. Can you think of some others?

Thrifty families know how to reduce the cost of shelter.

The family that manages its affairs efficiently is the one that reduces the costs of shelter as much as possible without sacrificing the comfort of the home. Poor planning can make for poor living even with adequate income.

Questions to Discuss and Things to Do

1. Here are some data on housing costs for large cities in the United States as found by the U. S. Bureau of Labor Statistics. They show the relation of housing expense (including fuel, light, and refrigeration) to income.

GROUPS	FAMILIES WITH AVERAGE ANNUAL INCOME OF	PER CENT OF TOTAL FAMILY EXPENSE THAT IS SPENT FOR HOUSING	AMOUNT SPENT FOR HOUSING
I	$ 625	35	____
II	875	34	____
III	1125	32	____
IV	1375	30	____
V	1625	29	____
VI	1875	27	____
VII	2375	26	____
VIII	2750	25	____
IX	3250	23	____
X	3750	22	____
XI	6250	21	____
XII	10000	20	____

(*a*) Write on a sheet of paper the amounts that should go in the blank spaces in the last column of this table. Does the amount spent increase with increase in income?

(*b*) Prepare two line graphs on the same axes. Let one represent the annual income shown in the first column. Let the other represent the costs of housing which you have just found for the last column. Where do you find the greatest difference between income and housing costs?

2. Assume that you are to furnish a house which has a kitchen, bathroom, living room, dining room, and three bedrooms. On a slip of paper write your estimate of how much it will cost to furnish the house in a moderate manner. Have a member of the class write on the board the estimates of all students. Then find the average.[1] Was your estimate more or less than the average?

The following problems suggest some ways economies may be made in the cost of shelter.

3. Mr. Williams paid taxes on his home at the rate of \$3.50 per \$100 of value. He discovered, on investigation, that because of depreciation (age of building), the taxed value should be reduced from \$5000 to \$3000. How much did this reduction save him in taxes?

4. Mr. Sadler always buys fire insurance on his house at the 5-year rate, which is four times the rate for a single year. How much does he save this way on his \$6000 policy if the 1-year rate is \$1.80 per \$1000?

5. Mr. Howard paints his house every 3 years. He does the work himself at odd times. He estimates that this saves $2\frac{1}{2}$ times the cost of the paint, which averages \$30 each time he paints the house. How much has he saved in this way if he has painted his house 6 times?

6. Mrs. Mason estimates that slip covers will protect her new living-room furniture to such an extent that the original tapestry will last twice as long as without them. The slip covers, which she made herself, cost \$24, and two sets of slip covers would last as long as the original tapestry. An upholstering job with tapestry cost \$90, and was necessary at the end of 10 years. How much will she save in 10 years' time?

7. Mrs. Walker has saved enough discarded woolen materials to make a new rug. It will cost her only \$16 to have it made. This is 40% of the cost of a new rug bought outright. How much will she save by supplying her own material?

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[1] To the Teacher. Students may be interested in comparing the estimates of the class with actual prices. Advertisements of furniture stores can be used to advantage.

8. Mrs. Boyd always turns her window shades when they become worn and soiled at the bottom. She claims that this adds 50% to the life of a shade. If the shades for her house cost $48, how much does she save on one set by turning?

9. If 1-party telephone service is $5.40 a month and 3-party service is $4.20, how much cheaper is the 3-party line per year?

10. A campaign was conducted in Mr. Hyde's community last winter to increase the efficiency with which furnaces are fired. By following the campaign suggestions Mr. Hyde concluded that he had reduced his average coal consumption by 10%. How much will this save him on his coal bill, if his average bill is $59.80 a year?

11. The Allens have fixed up a room which they formerly used for storage. It cost them $93 to fix it up, but they have rented it to a roomer for $5.50 a week. If the room is continuously occupied and expenses on it amount to $4 a month, how much will they have cleared at the end of 3 years, when the room needs fixing again?

12. The West End Coal Company allows a discount of 50¢ a ton on coal purchased from them during July and August. How much can be saved by buying 10 tons of coal in July or August?

13. Jane's mother promised her some new furniture for her bedroom as a graduation present. Jane selected a regularly stocked style of furniture that was priced at $76, with 10% discount for cash. Her mother gave her ___?___ dollars, which was the amount needed to pay cash. But Jane was a smart girl. She decided to wait until the August sales to see if she couldn't save enough from the gift to buy a new dress. In August the same furniture was on sale for $49.75 cash. How much money did Jane have for buying her new dress?

American Telephone & Telegraph Co.

Do you think the annual saving by having a 3-party line instead of a 1-party line would be enough to pay for feeding this boy's dog?

Both home owners and renters pay for shelter.

Have you heard someone say that it is cheaper to buy a home than to keep on renting? An argument often used is that if you buy a house and pay on it regularly each month, at the end of 20 years or so you own your home; but if you pay an equal amount for rent each month, at the end of 20 years "you have nothing." Do you think this is a sound argument? You may someday face a similar situation. Indeed, your present family may need to think their way through the intricacies of such a problem. It will be necessary to consider many social factors, such as location of job, possibility of position involving travel, availability of houses or apartments, and probable increase in number in family. But the problem of cost still plays a major part in the final decision.

Questions to Discuss and Things to Do

The first four of the following exercises will help you step by step to compare the cost of renting a house with the cost of owning a home of comparable value.

1. The Russells are now living in a new house on a small plot in a good residential district. The property is worth $10,000 and the monthly rental charge is 1% of the value of the property, or $_?_. Over a period of 20 years the value of the property may be expected to decrease about 30%. It will then be worth $_?_. As the property value decreases, the rental charge must also be decreased. The Russells will probably have to pay an average monthly rental of $90 for the 20 years. This amounts to $_?_ a year, and to $_?_ for 20 years.

2. (*a*) The Russells had $10,000 invested in 100 shares of stock, which had been regularly paying dividends of $1.00 a share four times a year. They considered selling the stock in order to raise the cash to buy the house in which they were living. If they sold the stock for $10,000, they would be losing $_?_ in dividends each year, and $_?_ for 20 years.

(*b*) If the Russells bought the house, they would have to pay taxes. To determine the cost, Mr. Russell looked up the records at the City Hall and found the property was assessed at 80% of its value, or $_?_, for taxation purposes. The local tax rate was $3.20 per $100 of assessed value. Hence the amount required for taxes each year would be $_?_, and $_?_ for 20 years.

(*c*) Also Mr. Russell realized that he would have to include in the cost of buying, the costs of property insurance, repairs and upkeep, and loss through depreciation of the house. Mr. Russell decided that insurance would cost him $16 per year for 20 years, or $_?_; the repairs and upkeep for 20 years would cost 20% of the original value, or $_?_, and the house would depreciate 30%, or $_?_, in value.

3. Mr. Russell wrote the answers to Examples 1 and 2 in a table so that he could compare the costs of renting and of buying.

COSTS OF RENTING A HOUSE AND OF BUYING FOR CASH

Renting:		
Rent for 20 years @ $90 per month (Ex. 1)	——	
Cost of renting, per year		——
Buying for cash:		
Dividends lost on stock sold to raise cash (Ex. 2 (*a*))	——	
Taxes for 20 years (Ex. 2 (*b*))	——	
Insurance, depreciation, and upkeep for 20 years (Ex. 2 (*c*))	——	
Total cost of buying	——	
Cost of buying per year		——
Difference in the cost of the two plans		——

4. Mr. Kramer is interested in buying the house where the Russells live, but he does not have $10,000 with which to pay for it.

(*a*) He consulted a local Building and Loan Association and was told that he could borrow 75% of the money needed to buy the $10,000 property. He must make a cash payment of 25% of the value of the property, or _?_. The remaining _?_ could be borrowed at 5% interest.

(*b*) Mr. Kramer arranged with the Building and Loan Association for a loan of $7500, to be repaid in 20 years. The Loan Association uses a table to determine a regular monthly payment, which will pay back both the principal and the interest in 20 years. This rate is $6.60 per month per thousand dollars borrowed. The monthly payments on the $7500 loan amount to __?__. In 20 years these payments will amount to __?__.

Subtract the average amount of principal ($7500) paid back from the total payments. What is the difference? This difference represents the total amount of interest that Mr. Kramer paid.

(*c*) How much would Mr. Kramer have received in interest each year if he could have invested the $2500 cash payment in government bonds at 2½% simple interest? The interest on $2500 for 20 years is __?__.

(*d*) Taxes, insurance, repairs, and depreciation are the same as were computed in Ex. 2 (*b*) and (*c*).

(*e*) Since Mr. Kramer will own the property at the end of 20 years, he can consider the value of the property at that time as money saved. If depreciation is considered to be 30%, the property will be worth $__?__ when all installments have been paid. Mr. Kramer can deduct this amount from the total payments made to the Building and Loan Association.

(*f*) Here is a summation of the costs of buying on time.

COSTS OF BUYING A HOUSE ON THE INSTALLMENT PLAN

Total payments on the loan of $7500 (Ex. 4 (*b*))	____	
Interest lost in 20 years on $2500 cash payment (Ex. 4 (*c*))	____	
Taxes for 20 years (Ex. 2 (*b*))	____	
Insurance, depreciation, and upkeep for 20 years (Ex. (2 *c*))	____	
Total expenditure	____	
Deduct value of property at end of 20 years (Ex. 4 (*e*))	____	
Actual cost for 20-year period	____	
Average cost per year for installment buying		____

*Building and Loan Associations have tables which show how much of the yearly payments on each $1000 indebtedness goes for interest each year. The following table shows such figures for payments of $6.60 per month or $79.20 per year for 20 years. Use this table in solving the three exercises below.

TIME	INTEREST	TIME	INTEREST
1st year	$49.33	11th year	$29.99
2nd year	47.79	12th year	27.47
3rd year	46.19	13th year	24.81
4th year	44.49	14th year	22.08
5th year	42.72	15th year	19.13
6th year	40.84	16th year	16.05
7th year	38.89	17th year	12.81
8th year	36.84	18th year	9.42
9th year	34.66	19th year	5.86
10th year	32.39	20th year	2.24

By subtracting each of these amounts from $79.20, you can determine how much the $1000 principal is reduced each year.

5.* Make two line graphs on the same sheet (same horizontal and vertical axes). Let one line show the amounts used to pay interest, and let the other show the amounts used to pay the $1000 principal over the 20 years. Where are these lines farthest apart? Where do they cross?

If the contract had been for 15 years at $7.91 per month, what general change would there be in the relation between the two graphs? (You need not draw graphs.)

6.* Mrs. Morton borrowed $7000 on a house and arranged a 20-year loan. At the end of 5 years she made a cash payment of $2000 and arranged a new 15-year loan on the balance. How much was the balance? (Use the table above to compute the amount by which the loan was reduced by the monthly payments of $6.60 per thousand for 5 years.)

7.* For 15 years Mr. Lee made monthly payments of $6.60 per $1000 on his $4000 loan. What cash payment would pay the balance? (Use the table above.)

PROBLEM IV

How Much Can You Save by Paying Bills Promptly?

Find out what bills come to your home or to a typical home in your neighborhood on which a saving can be made if they are paid promptly. Appoint a small committee to list the different items on which savings can be made.

If the class does well in the suggested investigation, probably no exercises in the following list need be done. However, if the investigation is not advisable, the exercises can be used to illustrate the more important types of saving and to provide good practice in computation.

Questions to Discuss and Problems to Solve

1. Here is the gas bill which Mr. Fox received for service during the month of September. The Consolidated Gas Company allows a discount of 10 cents per thousand cubic feet for bills paid before the 10th of each month. How much cash discount can Mr. Fox receive on this bill for 5300 cubic feet of gas? The net bill should then be _?_. If Mr. Fox's cash discount each month is the same as that for October, how much can he save in a year by paying his monthly gas bill before the 10th of each month? How much would a 3% sales tax add to the net bill shown in the illustration?

CONSOLIDATED GAS COMPANY
RICHMOND, OHIO
Office: 211–213 E. Lansing St.

For Gas Consumed for Month — Date Below

YEAR 19—	READINGS		GROSS BILL	NET BILL
	PRESENT	PREVIOUS		
August 31 Sept. 30	785	732	5.99	

To receive cash discount, this net bill must be paid on or before the 10th of the month.

Mr. Stewart A. Fox
127 Grand View
Richmond, Ohio

Since the electricity, gas, and water bills are part of the household expenses paid by Mrs. Fox, she always takes time to check the bills against her monthly budget.

Philip Gendreau

2. Here is Mr. Fox's electricity bill for services during September. The Electric Service allows 10% discount for payment within 10 days of the date of the bill. Mr. Fox's net bill for September is _?_. A 2% sales tax would add _?_ to his net bill. If Mr. Fox saves as much cash discount each month as he could on his September bill, he would save _?_ in 12 months.

ELECTRIC SERVICE, INC.

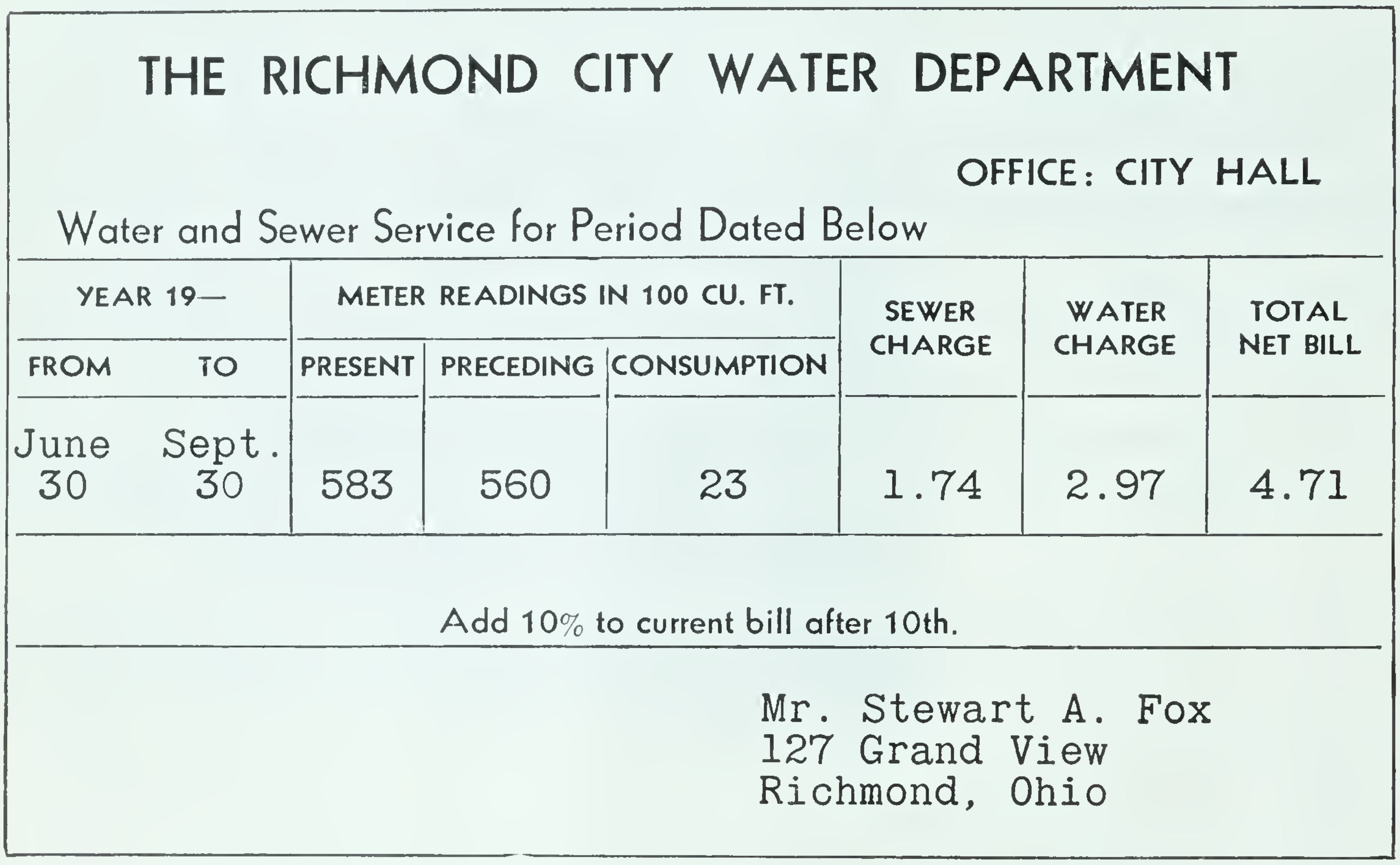
RICHMOND, OHIO

Net bill
Payable on or before Oct. 11, 19—

Mr. Stewart R. Fox
127 Grand View
Richmond, Ohio

METER READINGS DATES	METER READINGS PRESENT	KILOWATT–HOURS @ 9¢	GROSS BILL
Aug. 31	9592	20	$5.25
	PRECEDING	TOTAL KILOWATT–HOURS	NET BILL
Sept. 30	9482	110	

3. Mr. Fox gets his water and sewer service bill every three months. Here is his third-quarter bill.



THE RICHMOND CITY WATER DEPARTMENT

OFFICE: CITY HALL

Water and Sewer Service for Period Dated Below

YEAR 19—		METER READINGS IN 100 CU. FT.			SEWER CHARGE	WATER CHARGE	TOTAL NET BILL
FROM	TO	PRESENT	PRECEDING	CONSUMPTION			
June 30	Sept. 30	583	560	23	1.74	2.97	4.71

Add 10% to current bill after 10th.

Mr. Stewart A. Fox
127 Grand View
Richmond, Ohio

How much would be added to this bill if Mr. Fox did not pay the bill by Oct. 10? If his water and sewer service bills were the same in the other three quarters, what would he save in a year by prompt payments?

4. Mr. Fox runs a charge account at a service station which allows 2% discount for payment of bills within 10 days after rendered. Mr. Fox's gross bill for one month is $13.53. His discount is _?_ and his net bill _?_. If his gross bill amounts to $156.78 for a year, he will save _?_ by paying his bills by the 10th of each month.

5. Mrs. Fox buys most of the clothes for the family at a store that gives stamps for prompt payment. If 10 stamps are given for each dollar of purchase, and each stamp is worth $\frac{1}{4}$ cent, what rate of discount is allowed? If Mrs. Fox spends $180 per year at this store, how much does she save annually by paying promptly?

6. A penalty is usually added to a tax bill for not paying it within a short time after due. What will a 5% penalty amount to on a $27.35 tax bill?

Tues.

PROBLEM V

How Can You Save on the Cost of Operating a Car?

The fourth largest item of expense for the average wage earner's family is the automobile, a close rival to the expense for clothing or shelter. Do you know any ways of economizing on your automobile?

First you need to find how much it costs to drive an automobile. What is your guess as to the cost of driving an automobile a mile? If your father drives back and forth to his work daily and your home is 2 miles from his place of work, how much do you think the two trips a day actually cost?

To find the cost per mile for driving a car, you will have to consider many things besides the gasoline and oil used. Assume that you can buy a car for $2050 and that you drive it 45,000 miles in four years. Suppose that your car is then worth $950. How much do you think it has cost you to drive each of the 45,000 miles? What do you think the total cost is?

The following table is given as a suggested estimate of this cost.

Depreciation	$1100.00
Gasoline (figured at 27¢ per gal. and mileage at 15 miles per gal.)	810.00
Oil (figured at 40¢ per quart, 6 qt. capacity and change every 1500 miles)	72.00
Tires (recapping and replacement)	80.00
Lubrication ($1.00 every 1000 miles)	45.00
Repairs and adjustments	80.00
Insurance ($50.00 per year)	200.00
License ($15.00 per year)	60.00
Washing and miscellaneous	28.00
Total	$2475.00

According to these estimates it would have cost you $\frac{2475}{45000} = \$.05\frac{1}{2}$, or $5\frac{1}{2}$ cents, per mile to drive each of the 45,000 miles.

Can you think of ways to reduce the expense of operating an automobile? Some of the following exercises will help to give you a few ideas.

Questions to Discuss and Things to Do

1. If the cost of operating the family car is 5½ cents a mile and the distance from home to school is 3 miles, how much will it cost to drive to and from school each week? (The car makes one round trip each day for 5 days.)

2. If one-way bus tickets for school are 7 cents each, how much will it cost to ride to and from school on the bus for 5 days? What weekly saving could be made by buying a 40-ride bus ticket for $2.00?

3. Find out how far your family car or that of a neighbor is driven in a year. Use this information in the accompanying table to find the cost per mile of driving the car one, two, and three years. (If necessary to rent garage space, the cost of rental should be added to the costs for the items listed in the table.)

ITEMS OF EXPENSE	ONE YEAR	TWO YEARS	THREE YEARS
Depreciation	$250	$390	$450
Gasoline (27 cents per gallon; 15 miles per gallon)	——	——	——
Oil (40 cents per quart, 6 quarts every 1500 miles)	——	——	——
Tires (estimate cost in 3rd and 4th years)	Nothing	——	——
Lubrication ($1.00 every 1000 miles)	——	——	——
Repairs	Nothing	$ 30	$ 60
Insurance	$ 55	$ 45	$ 40
License ($18 per year)	——	——	——
Miscellaneous	$ 20	$ 30	$ 40
Total	——	——	——

4. Some families keep an accurate account of the cost of operating the family car. If there are two or more students in the class who can provide such records, the data can be used to make an interesting and worth-while comparison.[1]

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[1] TO THE TEACHER. The data given in these exercises are only estimates. It is suggested that a good project is likely to develop by having students collect data locally, and it may stimulate them to work out costs for their own family cars.

5. Mr. Hansen lived 5 miles from his office. By walking two blocks he could take a bus to and from his office at a cost of 15¢ each way. He could, however, drive his automobile at a cost of 5½¢ a mile and leave it in a parking lot for $2.50 a week. If he worked 5 days a week and made one round trip each day, how much more would it cost him each week to drive his car than it would to ride on the bus? Do you think the added convenience is worth the difference in cost?

6. Does the speed at which you drive your car have anything to do with how much gasoline you use? A study of this question gives facts like these:

SPEED IN MILES PER HOUR	MILES PER GALLON OF GASOLINE
10	17
20	22
30	22
40	21
50	19
60	17

Can you say from these facts that the slower you drive the better mileage you get? What are the speeds at which you get the best mileage?

On a 418-mile trip by automobile how much less will it cost to drive at 30 miles an hour than at 50 miles an hour if gasoline costs 27 cents per gallon?

7. The Highway Freight Company uses "retread" tires on its trucks. These retreaded tires last 80% as long on the Highway trucks as do new tires. Therefore, a worn tire which cost $75 new is worth 80% of $75 when retreaded. If the retreading of the company's worn tires costs only $35.25, the Highway Freight Company saves _?_ on each tire retreaded. If 45 of the tires used each year are retreaded tires, their annual saving is _?_.

8. Mr. Adams, who drives a truck for the Highway Freight Company, uses retreaded tires on his own car. He found that retreaded tires on his car lasted about 75% as long as new ones. Therefore, a new tire which cost $20.50 is worth 75% of $20.50, or _?_, when retreaded. If it cost $9.50 for each retread, how much would Mr. Adams save by having four tires retreaded?

9. A dealer in automobile accessories announces the following prices: Battery with 6-month guarantee, $9.60; with 2-year guarantee, $14.40; with 3-year guarantee, $18.00. Assuming that these batteries can be relied upon to last only as long as they are guaranteed, what is the cost per month of each of them? Which is cheaper per month? Under what conditions might you prefer to buy the lowest-priced battery?

10. A service station will change the oil in your car at 40¢ per quart, using oil in sealed cans. You can buy this oil in bulk for $6.20 for 5 gallons. If your car requires 6 quarts of oil, how much could you save each time you changed the oil by using the bulk oil and doing the job yourself?

Wed.

11. The usual price for having a car lubricated is $1.00. However, some service stations sell books of tickets for lubrication jobs. If you can buy a book containing 6 tickets for $3.90, how much will each lubrication job cost? This is _?_ cents less than the usual price of $1.00. How much will you save on lubrication costs in a year by buying tickets, if you drive your car 12,000 miles and have it lubricated every 1000 miles?

12. This table shows the influence of speed on the life of a tire.

Speed in miles per hour	20	30	40	50	60
Per cent of normal life of tire	100	80	60	45	35

(*a*) Draw a line graph representing these data.
(*b*) If a tire is usable for 25,000 miles at 20 miles an hour, how many miles can you expect it to last at 30 miles an hour? at 40? at 50? at 60?

13. These data show the influence of tire pressure on the life of a tire.

Per cent below normal pressure.	0	10	20	30	40	50	60
Per cent of normal life of tire . . .	100	80	62	48	36	27	20

Assume a tire will last 20,000 miles when kept inflated at normal pressure. Other things being equal, how many miles will it last when kept inflated 10% below? 20% below? 30% below? 40% below? 50% below? 60% below?

Press Association, Inc.

Can you extrapolate from your graph in Ex. 12 to determine the per cent of normal life of a tire for speeds of 100 miles per hour?

14. These data show the influence of overloading on the life of a tire.

Per cent above normal load........	0	10	20	30	40	50	60	70	80	90	100
Per cent of normal life of tire.......	100	82	68	58	50	44	39	35	31	28	25

Assume a tire lasts 20,000 miles when driven with a normal load. How many miles less will it last when driven 10% overloaded? when driven 40% overloaded? 80% overloaded? 100% overloaded?

PROBLEM VI

How Well Do You Know the Common Units of Measure?

There are a few units of measure which nearly everyone uses occasionally. Do you know these common units as well as you should? The following exercises will help you to discover whether you know the most frequently used units of measure. In these exercises, you need do no computation.

Thurs

Supply the missing words.

Write the numbers from 1 to 18 in a column on a work sheet. Look below at each phrase and opposite its number on your work sheet supply the missing word.

SAMPLE. We usually measure a farm by the _?_.
Insert the word *acre* in the blank space.

We usually measure —

1. a part of a year by the _?_.
2. sugar by the _?_.
3. oats by the _?_.
4. coal by the _?_.
5. eggs by the _?_.
6. milk by the _?_.
7. an angle by _?_.
8. gasoline by the _?_.
9. the length of a room by the _?_.
10. the area of a field by the _?_.
11. the area of a state by the _?_.
12. the distance between two cities by the _?_.
13. water on a water meter by the _?_.
14. electricity used in the home by the _?_.
15. the wave length in radio by _?_.
16. the temperature of a room by _?_.
17. cloth for a dress by the _?_.
18. the size of a prescription bottle by the _?_.

A drill exercise on relations between units of measure.

$\frac{3}{4}$ bu. = ? pk.
$\frac{1}{2}$ gal. = ? qt.
$\frac{1}{4}$ ft. = ? in.
$\frac{3}{4}$ yd. = ? in.
$\frac{1}{2}$ yd. = ? ft.
$\frac{5}{8}$ lb. = ? oz.[1]
$\frac{3}{8}$ qt. = ? pt.
$\frac{1}{4}$ lb. = ? oz.
$\frac{1}{4}$ bu. = ? pk.
1 yd. = ? in.
$\frac{3}{4}$ ft. = ? in.
$\frac{1}{3}$ hr. = ? min.

$\frac{3}{4}$ ft. = ? in.
$\frac{1}{4}$ gal. = ? pt.
$\frac{1}{2}$ ton = ? lb.
$\frac{5}{8}$ mi. = ? rods
$\frac{1}{2}$ qt. = ? pt.
$\frac{4}{5}$ hr. = ? min.
$\frac{1}{5}$ ton = ? lb.
$\frac{1}{2}$ bu. = ? pk.
$\frac{1}{6}$ yd. = ? in.
$\frac{2}{3}$ ft. = ? in.
$\frac{1}{2}$ lb. = ? oz.
1 mi. = ? ft.

1 gross = ? things
$\frac{1}{3}$ sq. ft. = ? sq. in.
$\frac{5}{6}$ cu. ft. = ? cu. in.
$\frac{1}{8}$ gal. = ? pt.
$\frac{1}{3}$ sq. yd. = ? sq. ft.
$\frac{1}{4}$ sq. ft. = ? sq. in.
$\frac{2}{3}$ sq. yd. = ? sq. ft.
$\frac{1}{2}$ cu. ft. = ? cu. in.
$\frac{3}{4}$ gal. = ? qt.
$\frac{1}{4}$ cu. ft. = ? cu. in.
$\frac{1}{4}$ hr. = ? min.
1 gross = ? things

If you are weak on measures, now is the time to review the tables of measures. (See the back of this book.)

A drill on a few harder units.

6 ft. = ? in.
6 ft. = ? yd.
7 pk. = ? bu.
1 yd. = ? in.
18 oz. = ? lb.
3 hr. = ? min.
9 yd. = ? ft.
9 qt. = ? gal.
5 lb. = ? oz.
4 ft. = ? in.
5 ft. = ? yd.
10 pk. = ? bu.
4 yd. = ? in.
30 oz. = ? lb.
7 hr. = ? min.
11 yd. = ? ft.

7000 lb. = ? tons
80 min. = ? hr.
10 qt. = ? gal.
3 lb. = ? oz.
3 tons = ? lb.
4 qt. = ? pt.
3 pk. = ? qt.
26 pt. = ? qt.
3.2 gal. = ? qt.
8 gal. = ? pt.
10 tons = ? lb.
18 qt. = ? pt.
9 pk. = ? qt.
20 pt. = ? qt.
7.5 gal. = ? qt.
6 gal. = ? pt.

5 doz. = ? things
21 things = ? doz.
9 doz. = ? things
30 things = ? doz.
100 min. = ? hr.
4 cu. yd. = ? cu. ft.
36 doz. = ? gross
4 rt. angles = ? degrees
10 sq. mi. = ? acres
72 cu. ft. = ? cu. yd.
3000 lb. = ? tons
4 cu. yd. = ? cu. ft.
40 things = ? scores
1 rt. angle = ? degrees
4 sq. mi. = ? acres
36 cu. ft. = ? cu. yd.

---

[1] In this book we use 16 ounces to the pound and 2000 pounds to the ton.

Thurs.

Problems with Common Units of Measure

1. While looking through the lists of August furniture sales, Mrs. Allison saw that broadloom carpet, which had been selling for $4.95 per sq. yd., was marked down 20%. She thought, "If I bought a 9-foot by 12-foot rug for the living room, it would cost $__?__."

2. For their class picnic, the committee figured that they should have about 3 cups of lemonade for each of the 26 students. If they used a 5-gallon container, they could serve __?__ cups of lemonade. Would the container be large enough? (A standard cup holds $\frac{1}{2}$ pint.)

3. The Ebony Coal Company published its summer rates on coal. No order for less than 6 tons could be made at the summer rate, and 50% of the order would have to be delivered at once. Mr. Allison would like to take advantage of the offer, but does not know whether his coalbin is large enough. His coalbin is 6 ft. by 4 ft. by 5 ft. and each ton of the coal takes up about 35 cu. ft. of space. Can Mr. Allison order his coal at the reduced rate?

4. The school cafeteria sold 256 half-pints of milk each day. Therefore, the daily order for milk was __?__ gallons.

5. On Friday, Howard unloaded 140 bags of calcium chloride. Each bag weighed 100 lb. He unloaded __?__ tons of calcium chloride.

6. Potatoes are selling in 15-lb. bags for 50¢ a bag. At this rate they are selling at $__?__ per bushel of 60 pounds.

7. After measuring her windows, Mrs. Allison decided that her curtains should be at least a yard and 29 inches long. The curtains she liked at the store came in four lengths: 60 inches, 72 inches, 81 inches, and 90 inches. She will need to buy the __?__-inch curtains to cover her windows.

8. In a 10-oz. bottle of ginger ale there is __?__ pt.

9. Mrs. Allison was in charge of refreshments for "guest night" at her club meeting. She planned to make 50 cups of coffee. One pound of coffee makes about 40 cups; so she will need __?__ pounds of coffee. She has two 2-gallon coffeepots in which to make the coffee. Will she have to make more than the two pots of coffee?

Final Test on Unit II

PART I: NEW TERMS

1. Some of the new words used in this unit appear in Column B. Situations which illustrate uses of ten of these terms appear in Column A. You are to find a term in Column B which you think fits each situation in Column A. Copy the letters (*b*) to (*j*) in a column and put the number of the correct term at the left of the letter for each statement in Column A. The first statement is marked as a sample.

COLUMN A

__1__ (*a*) The typical wage earner spends about $\frac{1}{3}$ of his income for food each year.

__?__ (*b*) Mr. Fox read on his gas bill that if he paid it by the 10th of the month he would have to pay only $3.60.

__?__ (*c*) After the 10th of the month Mr. Fox's bill would be $4.00.

__?__ (*d*) The Russells decided they must add to the cost of buying shelter the cost of protection against fire and wind.

__?__ (*e*) The Russells figured they would lose $5 per share each year on their stock if they sold it to buy a house.

__?__ (*f*) The Russells now pay $45 per month to their landlord.

__?__ (*g*) Mr. Kramer said that only part of the monthly payments would go toward reducing the $4500 loan on the house.

__?__ (*h*) Mr. Adams estimates that he saves about 3% on his bills by paying them promptly.

__?__ (*i*) Mr. Adams claims that the largest single cost of operating a car the first year is usually the decrease in resale value.

__?__ (*j*) Bill paid $3 down and is now paying $2 per week on his bike.

COLUMN B

1. Average
2. Bargain
3. Depreciation
4. Discount
5. Dividend
6. Gross bill
7. Installment
8. Insurance
9. Interest
10. Net bill
11. Principal
12. Rent

PART II: UNITS OF MEASURE

In each of the following statements select from the four possibilities the one which seems to you *best* to complete the statement.

2. The Franklins buy potatoes in large quantities to get a cheaper price. They probably buy them by the —

(*a*) ton (*b*) pound (*c*) ounce (*d*) bushel

3. To compare the cost of buying crackers in large and in small packages, you would compute the cost per —

(*a*) pound (*b*) ounce (*c*) package (*d*) dozen

4. The Allens buy rice in bulk to get it at a cheaper price. They probably buy it by the —

(*a*) ounce (*b*) quart (*c*) pound (*d*) gallon

5. If chocolate sells at the rate of 2 cents per ounce, a pound would cost —

(*a*) 24 cents (*b*) 32 cents (*c*) 16 cents (*d*) 64 cents

6. Dress material is usually sold by the —

(*a*) foot (*b*) yard (*c*) inch (*d*) rod

7. Gasoline is usually sold to automobile owners by the —

(*a*) barrel (*b*) gallon (*c*) million BTU's (*d*) ton

PART III: PROBLEMS

8. Mr. Morgan estimates that a new car depreciates 40% in value the first year it is owned. How much would a car that cost $2125 depreciate the first year at this rate?

9. At $5\frac{1}{2}$ cents per mile Mr. Morgan's car costs him ___?___ per year if he drives it 7500 miles.

10. Canned peaches sell for 15 cents for an 11-ounce can, or 25 cents for a 21-ounce can. How much cheaper per pound are the peaches in the large can?

11. A prime rib roast of $3\frac{3}{4}$ pounds at 98 cents per pound costs ___?___ more than $3\frac{3}{4}$ pounds of ground beef at 62 cents per pound.

12. Families with incomes of about $1500 spend on the average $7\frac{1}{2}\%$ for clothing. Those with incomes of $3000 spend an average of 10% for clothing. How much more does clothing cost the latter group?

13. 10% cash discount on a bill of $6.72 amounts to ___?___.

PART IV: ANALYZING PROBLEMS

14. Mr. Thompson and a friend were comparing the cost of operating their cars. Both have the same model of the same make of car. They thought their operating expenses should be about the same. Mr. Thompson estimated that it cost him $4\frac{1}{2}$ cents per mile to operate his car. His friend thought it cost him $5\frac{1}{2}$ cents per mile to operate his car.

Which of the following statements do you think is to be accepted?

1. Mr. Thompson's estimate is correct.
2. His friend's estimate is correct.
3. Each man may be accurately estimating the cost of operating his car.

In the following list check the information you will need to have before you can *know* which of the statements above is to be accepted. (*Do not write in this book.*)

(*a*) How many miles each car is driven per year

(*b*) Speed at which the cars are usually driven

(*c*) How much the cars have depreciated

(*d*) Dealers from which the cars were bought

(*e*) Cost of gasoline and oil used

(*f*) Cost of tires and repairs

(*g*) Cost of extra expenses incurred while using the car, such as hotel bills, baseball games attended, etc.

(*h*) Amount of taxes

(*i*) Cost of greasing and other service charges

(*j*) Number of members in each family

(*k*) Garage rent and parking charges

(*l*) Number of miles cars are driven for recreational purposes

TESTS ON COMMON FRACTIONS

Inventory Test 5: Changing the Form of a Fraction

Follow the directions below. *Time, 4 minutes.*

Write each of these as a whole or a mixed number. Each fraction should be in the simplest form. Here is a sample: $\frac{22}{6} = 3\frac{2}{3}$

$\frac{14}{3}$ $\frac{17}{5}$ $\frac{21}{6}$ $\frac{19}{5}$ $\frac{42}{8}$ $\frac{65}{9}$ $\frac{25}{8}$ $\frac{16}{13}$

$\frac{41}{15}$ $\frac{50}{24}$ $\frac{28}{7}$ $\frac{96}{8}$ $\frac{32}{4}$ $\frac{20}{10}$ $\frac{7}{6}$ $\frac{15}{9}$

Change these mixed numbers to improper fractions:

$7\frac{1}{3} = \frac{}{3}$ $11\frac{2}{7} = \frac{}{7}$ $7\frac{3}{4} = \frac{}{4}$ $1\frac{7}{8} = \frac{}{8}$ $3\frac{5}{6} = \frac{}{6}$

$2\frac{3}{5} = \frac{}{5}$ $4\frac{5}{8} = \frac{}{8}$ $9\frac{1}{2} = \frac{}{2}$ $4\frac{5}{12} = \frac{}{12}$

Supply the missing numerators:

$\frac{1}{3} = \frac{}{6}$ $\frac{7}{8} = \frac{}{24}$ $\frac{5}{9} = \frac{}{18}$ $\frac{1}{2} = \frac{}{8}$ $\frac{3}{8} = \frac{}{40}$

$\frac{3}{5} = \frac{}{100}$ $\frac{3}{4} = \frac{}{40}$ $\frac{2}{3} = \frac{}{12}$ $\frac{4}{5} = \frac{}{20}$ $\frac{5}{6} = \frac{}{24}$

In adding —

Thirds and *sixths,* I think of them as __?__ths.
Sixths and *sixths,* I think of them as __?__ths.
Halves and *fourths,* I think of them as __?__ths.
Thirds and *ninths,* I think of them as __?__ths.
Thirds and *fifteenths,* I think of them as __?__ths.
Sevenths and *sevenths,* I think of them as __?__ths.
Twelfths and *twelfths,* I think of them as __?__ths.
Thirds and *fourths,* I think of them as __?__ths.
Halves and *sixths,* I think of them as __?__ths.
Halves and *eighths,* I think of them as __?__ths.
Thirds, sixths, and *ninths,* I think of them as __?__ths.
Thirds, sixths, and *twelfths,* I think of them as __?__ths.
Halves, thirds, and *fourths,* I think of them as __?__ths.
Halves, fifths, and *tenths,* I think of them as __?__ths.

See answers, page 423. If you had more than one answer wrong, you should turn to Practice Tests 5 A to 5 D on pages 408–410.

Inventory Test 6: Addition of Fractions

Remember that each answer must be in its simplest form.

Time, 4 minutes. Add:

$$\begin{array}{cccc} \frac{2}{3} & \frac{4}{5} & \frac{3}{4} & \frac{1}{2} \\ \frac{1}{2} & \frac{7}{10} & \frac{1}{8} & \frac{5}{16} \\ \hline \end{array}$$

$\frac{3}{4} + \frac{7}{8} =$ $\frac{2}{3} + \frac{5}{8} =$ $\frac{7}{12} + \frac{5}{8} =$

$\frac{4}{5} + \frac{7}{20} =$ $\frac{5}{6} + \frac{2}{3} =$ $\frac{1}{7} + \frac{2}{3} =$

$\frac{1}{3} + \frac{5}{6} + \frac{7}{12} =$ $\frac{3}{4} + \frac{5}{16} + \frac{1}{8} =$

$\frac{2}{3} + \frac{1}{4} + \frac{5}{8} =$

$$\begin{array}{cc} 4\frac{7}{12} & 9\frac{1}{2} \\ 7\frac{2}{3} & 6\frac{4}{5} \\ \hline \end{array}$$

See answers, page 423. If you failed to pass this test, turn to Practice Tests 6 A to 6 D on pages 410–411.

Inventory Test 7: Subtraction of Fractions

Time, 4 minutes. Subtract:

$$\begin{array}{cccccccc} \frac{5}{8} & \frac{6}{7} & \frac{7}{8} & \frac{1}{6} & \frac{4}{5} & \frac{7}{9} & \frac{5}{8} & \frac{9}{10} \\ \frac{1}{2} & \frac{1}{3} & \frac{2}{3} & \frac{1}{7} & \frac{1}{4} & \frac{1}{3} & \frac{2}{5} & \frac{3}{4} \\ \hline \end{array}$$

$\frac{7}{8} - \frac{2}{3} =$ $\frac{7}{9} - \frac{1}{3} =$ $\frac{1}{3} - \frac{1}{6} =$ $\frac{7}{12} - \frac{1}{5} =$

$\frac{4}{5} - \frac{3}{4} =$ $\frac{15}{16} - \frac{3}{4} =$ $\frac{5}{9} - \frac{2}{7} =$ $\frac{9}{10} - \frac{5}{6} =$

$$\begin{array}{cccc} 9\frac{2}{3} & 4\frac{3}{4} & 15\frac{1}{2} & 7\frac{1}{7} \\ 4\frac{1}{2} & 2\frac{7}{8} & 4\frac{3}{4} & 5\frac{2}{3} \\ \hline \end{array}$$

See answers, page 423. If you failed to pass this test, turn to Practice Tests 7 A to 7 C on pages 411–412.

Inventory Test 8: Multiplication and Division of Fractions

Watch the sign in each example. An answer is counted right only if it is in the simplest form. *Time, 4 minutes.*

$8 \times \frac{3}{4} =$

$1\frac{3}{5} \times 2\frac{1}{5} =$

$\frac{7}{9} \div \frac{2}{3} =$

$6\frac{1}{7} \div 1\frac{1}{7} =$

$\frac{3}{4} \times \frac{1}{6} =$

$1\frac{1}{3} \times 5\frac{1}{6} =$

$\frac{3}{5} \div \frac{5}{6} =$

$4\frac{1}{3} \times 2\frac{2}{5} =$

$\frac{5}{6}$ of 50 $=$

$3\frac{2}{5} \times 7 =$

$6\frac{1}{3} \div \frac{1}{3} =$

$5\frac{1}{3} \times 3\frac{3}{8} =$

$2\frac{5}{8} \div \frac{3}{8} =$

$5\frac{1}{9} \div \frac{2}{3} =$

$\frac{4}{9}$ of 72 $=$

$4\frac{1}{3} \div 6 =$

$\frac{11}{12} \div 3 =$

See answers on page 423. If you failed to pass this test, turn to Practice Tests 8 A to 8 D on pages 412–413.

RUGS ON TIME
...nal Cost
YOUR CREDIT CARD MAKES BUYING EASY
The Thrift Plan
NO EXTRA COST TO YOU!
AUTOMOBILE LOANS UP TO $300
$30 D... $1 ... Week
OWN YOUR HOME ON EASY TERMS
10 MONTHS PAYMENT PLAN
Budget Plan—Small...
Easy Terms AS LONG AS 18 Months
LOANS ON CONVENIENT TERMS
TRY OUR FREE FINANCE PLAN
APPLIANCE ... TIME
BIG DI...
YOU CAN BUY A FUR COAT
Better Read Before You Sign
LOANS!

Ewing Galloway

UNIT III

Using Consumer Credit

The Meaning of Consumer Credit

On every hand you are urged to use credit to buy things for which you cannot pay cash. Newspapers, magazines, billboards, and catalogues invite you to borrow money or to buy on the installment plan. Many people believe that reckless buying on the installment plan is not a good thing for the consumer and can throw our economic machinery out of gear. Twice in recent years Congress has passed laws regulating consumer credit.[1]

What price do you have to pay for using these plans for obtaining easy credit? Are the claims of the advertisements correct? To what extent are consumers using some credit plan for their purchases? Should a person buy on credit at any time or should he always wait until he can pay cash? These are some of the questions this unit will help you answer.

What is ***consumer credit?*** Have you ever arrived at school without money and discovered that you had left your lunch at home? In such a case, what did you do? You may have asked the cashier at the cafeteria to let you have lunch on the promise to pay the next day, or you may have borrowed money from a friend. In either case you are using consumer credit. You are also using consumer credit when you purchase something and agree to pay for it at a later date or to make regular weekly or monthly payments. In fact, if you have a charge account at the grocer's or at a department store, and pay your bill monthly, you are using consumer credit.

A merchant uses a different kind of credit when he needs money to buy goods. He may borrow the money directly, or he may buy the goods on the promise to pay at a later date. He is using ***commercial credit*** regardless of which way he gets the goods.

There is a fundamental difference between the two kinds of credit. The person using consumer credit expects to consume what he buys with his credit and must pay his debt from earnings not connected with the items purchased. The merchant using commercial credit expects to sell at a profit the goods he buys with his credit, and therefore plans to pay his debt from the sale of those goods. In this unit we deal entirely with the problem of consumer credit.

---

[1] To the Teacher. Any inquiry concerning present regulations governing consumer credit should be addressed to the Federal Reserve branch bank in the consumer's district.

Harold M. Lambert from Frederic Lewis

The cost of food and clothing for Sam's four active youngsters keeps him "humping."

PROBLEM I

What Do You Know about Consumer Credit?

Sam Robinson was a mechanic in the American Aircraft Company. Both his foreman and the company personnel manager knew that Sam was never absent and that his work was highly dependable. Sam made small but regular savings deposits and he bought as many government Savings Bonds as he could. His four young children were always needing something, but with careful management Sam and his wife were able to "keep their heads above water."

But one morning, quite unexpectedly, hard luck came to Sam. When he got off the bus that took him to the plant, he walked behind it and started across the street. A screech of brakes, then a blinding pain — Sam had been hit by a passing car. At the hospital he was told that he would not be able to go back to work for at least six weeks.

With income reduced, Sam had to use his savings to pay medical and other bills. When this money was gone, he still had several unpaid bills amounting to nearly $100. The persons he owed knew that he was honest and would pay when he could; so they did not press him for immediate payment. But Sam realized it would take him some time to get his financial affairs straightened out, and he greatly disliked having to delay the payment of his debts.

Sam thought it might be better if he owed all the money to one person and could arrange to make regular payments to that person. He had heard about a man who lent money without requiring bonds or other property to insure the payment of the loan. So Sam decided to see if he could obtain a loan. He promptly received a loan of $100, for which he signed an agreement to make weekly payments of $6.

Each week, for twenty weeks, Sam made his 6-dollar payment on the loan. He decided that the loan should be paid back by this time; so he went to see the man who had lent him the money. To his surprise, he discovered that the 6 dollars he had been paying weekly paid the interest only and that he still owed the $100. In order to reduce the loan, Sam offered to pay $20 that he had managed to save since going back to work. Sam was told that the agreement he signed when he got the loan required the repayment of the $100 in one payment. This is one way the loan shark prolongs the payments on a loan.

Sam felt helpless in the hands of this greedy moneylender. One of his children needed to have his tonsils removed. With this extra expense he knew he would do well to continue paying the $6 weekly, not to mention saving enough to pay a lump sum of $100. Frankly, Sam did not know what to do.

Sam's financial worries interfered with his efficiency at work and his foreman soon noticed the change. Finally, the foreman sent Sam to see the counselor in the personnel director's office. After listening to Sam's story, the counselor immediately notified the local authorities of the moneylender's activities. He then wrote a letter to the cashier of a local bank, telling him of Sam's record of honesty and faithfulness. He also told the cashier about Sam's financial troubles that resulted from dealing with an illegal loan shark. The counselor gave Sam the letter and told him he would have honest treatment at the bank, which was a reputable institution of long standing. The counselor further advised Sam to borrow only from legally regulated sources of credit if he must borrow in the future.

At the bank the cashier received Sam in a friendly manner and listened to a detailed account of Sam's financial problem. He arranged through the personal loan department of his bank to lend Sam $100. Sam was to make weekly payments of $6.63 for sixteen weeks. At the end of that time the loan would be completely repaid. Relieved of much worry, Sam now went to work with renewed spirit.

Consumer credit affects millions.

Would it be hard to find persons in your community who have had the same sort of threat to their financial security as that which faced Sam Robinson? It has been estimated that during a recent year as much as 160 million dollars has been borrowed from illegal loan sharks who charged interest up to 1200%. In the same year various credit agencies — acting legally — granted 14 billion dollars' worth of credit to consumers in America. This large sum does not include mortgages on homes, unpaid doctors' bills, loans on insurance policies, and money borrowed from friends or relatives. In a single year, twenty million families — representing every element of American society — faced conditions which they thought made it desirable for them to borrow money. As you study this unit, remember that more than half our families have been known to meet the problem of *consumer credit.*

Questions to Discuss and Things to Do

1. Government reports give the following estimates of the number of million dollars of consumer credit outstanding in the United States for each year indicated.

1939 — 7,031
1940 — 8,163
1941 — 8,826
1942 — 5,692
1943 — 4,600
1944 — 4,976
1945 — 5,627
1946 — 8,677
1947 — 11,862
1948 — 14,366
1949 — 16,809
1950 — 20,097
1951 — 20,644
1952 — 19,771 (April)

(*a*) Prepare a graph showing the trend of consumer credit from 1939 to 1952.

(*b*) From 1941 to 1944 there was a continuous decline in the amount of consumer credit. What conditions prevailed that explain this trend?

(*c*) From 1945 to 1950 there was a sharp increase in the amount of consumer credit. What conditions prevailed during this period which explain the rise?

2. What do you believe has been the trend of consumer credit since 1952? If you are interested in bringing your graph up to date, you may write to the nearest Federal Reserve bank for recent estimates.

3. What new articles or services are likely to be sold to the American consumer on the installment plan in the next few years?

4. The government started regulating consumer credit early in World War II. Do you think this was a good thing? Why? Does the government regulate consumer credit now? You may find out by writing to the nearest Federal Reserve Bank.

5. If you were starting a home of your own, what are some things you would feel justified in buying on the installment plan? What are some things you should purchase only when you can pay cash?

The rate of interest determines the cost of consumer credit.

There are many kinds of consumer credit and many agencies from which such credit may be secured. A consumer should shop as carefully for credit as he does for food and clothing. His credit shopping is more difficult, though, because the cost of credit is not so clearly displayed as are food and clothing prices. If a person is trying to decide whether to borrow money in order to pay cash for some necessity, or to buy on the installment plan, he must use a basis for comparing the cost of the two sources of credit. *Rate of interest* is an excellent basis of comparison. It is the *rate* at which a person pays for the credit he receives, and is expressed as a per cent. Six per cent interest, for example, means that for every dollar borrowed the borrower must pay interest at the rate of six hundredths of a dollar, or six cents, a year for its use. The interest on \$500 at 6% for 1 year is $\$500 \times .06 = \$30$. Unless otherwise stated in an agreement, or a problem, the interest rate is assumed to be an annual (yearly) rate.

From your earlier courses in mathematics you probably remember something about a formula $I = prt$. This is a *fundamental* formula for computing the interest in any form of loan or investment. Since we are going to use the formula in this and later units, we may need to review its meaning.

We can translate $I = prt$ as follows: To find I (the amount of interest in dollars), we multiply p (the amount borrowed, called the principal, in dollars) by r (the rate of interest in hundredths) by t (the time in years). Or we can state this rule as follows: Interest equals principal times rate times time.

If any three quantities are known, we can find the fourth.

(1) The formula is easy to use when finding the amount of interest in a problem like this:

How much interest does Mr. Monroe pay on a loan of \$250 for 6 months ($\frac{1}{2}$ year) at 6%?

Solution. Write the formula: $I = prt.$
Substitute the known values: $p = \$250,\ r = .06,\ t = \frac{1}{2}$
Then: $I = 250 \times .06 \times \frac{1}{2} = \underline{\ ?\ }$

(2) You can also use the formula to find the rate of interest:

John Mason borrowed \$200 to help pay college expenses. He paid a total of \$36 in interest for the 3 years that he owed the money. What rate of interest did he pay?

Solution. Write the formula: $I = prt.$
Substitute the known values: $I = \$36,\ p = \$200, \text{ and } t = 3$
Then: $36 = 200 \times r \times 3$
Or $36 = 600\,r$
Divide both sides by 600: $\frac{36}{600} = r$
And $r = .06, \text{ or } \underline{\ ?\ }\,\%$

(3) In a similar way the interest formula can be solved for p.

Find the principal when the rate is 5%, the time is 2 years, and the interest is \$30.

Solution. Write the formula: $I = prt.$
Substitute for I, r, and t: $30 = p \times .05 \times 2$
And $30 = p \times .1$
Divide both sides by .1: $\frac{30}{.1} = p$
Or $p = \underline{\ ?\ }$

(4) And last of all, the formula can be used to find t.

Philip Poole borrowed \$600 at 3% interest. If he paid a total of \$72 interest, for how many years did he borrow the money?

Solution. Write the formula: $I = prt.$
Substitute for I, p, and r: $72 = 600 \times .03 \times t$
And $72 = 18\,t$
Or $t = \underline{\ ?\ }$ years

We have used a basic rule of mathematics in *solving for r, p,* and *t* in the solutions on the preceding page. It may be stated like this: *If two quantities are equal, they may be divided by the same number, and the resulting quotients will be equal.*[1]

Questions to Discuss and Problems to Solve

1. What is the interest rate on a loan of $300 for 2 years if the total interest is $30?

2. How much interest must be paid on a loan of $750 for 10 years at 3%?

3. Mr. Morris paid $48 interest at 4% on a $600 loan. For how long a period was the loan?

4. Mary Harris and Jane Walker each borrowed enough money at 6% to pay tuition in a business course. Mary paid her loan off in two years and Jane paid hers in three. Mary's interest amounted to $18 and Jane's was $27. How much did they borrow together?

5. Find the missing item in each of these exercises.

	I	*p*	*r*	*t*
(*a*)	—	$1500	3%	4 years
(*b*)	$70	350	—	5
(*c*)	81	—	6	3
(*d*)	66	825	4	—
(*e*)	45	600	—	3
(*f*)	—	275	8	4
(*g*)	350	2000	—	7
(*h*)	74.25	550	$4\frac{1}{2}$	—
(*i*)	—	1500	$3\frac{1}{2}$	5
(*j*)	225	—	5	6

---

[1] To the Teacher. The multiplication, subtraction, and addition axioms may be introduced at this time if there is sufficient interest in this simple algebra.

6. Mr. Duke borrowed $500 from his brother for 6 months to make the final payment due on his home. At the end of 6 months he repaid the loan and $15 interest. What rate of interest did he pay?

7. Mr. Brown was 3 months late in paying his property taxes of $42, and the government charged him 63 cents interest. What was the annual rate?

8. A coal dealer advertises coal at $15 per ton cash, or $16 per ton payable within 60 days. What is the annual interest rate on the time payment?

9. A carpenter borrowed $50 from a licensed loan agency, using his tools as security. At the end of one month he paid off his debt with $51.50. What yearly rate of interest did he pay?

10. The Quick Cash Loan Company, operating illegally, made a loan of $15, to be repaid with $3.50 interest at the end of the month. Find the annual rate.

11. Mr. Craig borrowed $400 on a life insurance policy, and at the end of 9 months paid off the loan with $418. What was the annual rate of interest?

12. Carl Sands wanted the bicycle which a hardware store had listed at a cash price of $40.00. By charging the purchase to his father's account, Carl could pay for the bicycle in 60 days, but at the time-price of $40.80. How much more would the bicycle cost on time? This represents an interest rate of _?_%.

13.* George Arthur has been considering the purchase of a *Machinist's Handbook.* One day he saw an advertisement for such a book priced at $8.00. The advertisement stated that payment need not be made for 60 days after receipt of the book. However, if George sends cash with the order, he will receive a 12-inch steel rule free. George thinks that the steel rule is worth 75¢. If he decides to make the payment at the end of 60 days instead of sending cash, what annual interest rate does his 60-day credit cost?

PROBLEM II

What Does Credit Cost When We Buy on the Installment Plan?

Bill Fischer had the offer of a job making deliveries for a drugstore during the summer months. He would have to buy a bicycle if he took the job.

Bill went to the Ace Department Store and selected a bicycle marked $42.50.

Bill asked the clerk, "Could I buy this 'bike' and pay something on it each month?"

"Yes, you can buy it by paying $15 down and $8 each month for 4 months," the clerk told Bill.

Bill hurried home to tell his father and mother the good news about the bicycle.

"Dad, I can easily take $8 each month from my earnings, and I already have $15 in savings which I can use for the down payment," Bill told his father.

"I guess you can do it all right, son, but do you realize that you will be paying a high rate of interest?" Bill's father asked.

"I'll pay only $47.00 all together if I buy on the installment plan, and the cash price is $42.50. So the interest is $4.50 on $42.50, which means the rate is a bit more than 10%," Bill assured his father.

"But you are not figuring right," Bill's father objected.

Bill's mother interrupted at this point. "Now, Dad, don't discourage Bill. What difference does the rate of interest make? It seems to me that $4.50 is small enough when the bicycle will enable Bill to earn about $60 each month."

(1) What do you think of the reasoning of Bill's mother in this particular instance?

(2) Do you think Bill would be paying a rate of interest considerably more than 10%?

(3) Which of these rates do you think is closest to the true rate of interest: 15%, 20%, 33⅓%, 50%, 66⅔%, 75%, 90%, 100%?

There is a simple way to compute installment interest.

Let's assume Bill bought the bicycle on time, and let's see just what rate of interest he did pay. There are several ways by which the rate of interest may be computed as well as a way of estimating the approximate rate of interest. Each of these methods is fundamentally the same, as will be indicated as you go along. Here is one way of making the computation.

Note that the cash price is \$42.50 and that Bill pays \$15 down and \$8 a month for 4 months, or \$47 all together. The interest is the difference between the total amount paid on the installment plan and the cash price, or \$47 − \$42.50 = \$4.50.

Let us assume that the \$4.50 interest is paid as a part of the last payment.

On this assumption Bill owes a principal of —

\$42.50 − \$15.00, or \$27.50 during the first month
\$27.50 − \$ 8.00, or \$19.50 during the second month
\$19.50 − \$ 8.00, or \$11.50 during the third month
\$11.50 − \$ 8.00, or \$ 3.50 during the fourth month

(NOTE. \$3.50 plus interest of \$4.50 makes last payment \$8.00.)

The sum of the amounts owed each month represents a total principal which Bill owed for a period of one month. This sum is \$62. A principal of \$62 for one month is equivalent to a principal of $\$\frac{62}{12} =$ \$5.17 for one year. Bill paid \$4.50 in interest. If these values are substituted in the fundamental formula, $I = prt$, it becomes

$$4.50 = 5.17 \times r \times 1$$

Dividing by 5.17: $$\frac{4.50}{5.17} = r$$

And $$r = .87, \quad \text{or} \quad 87\%$$

No doubt Bill's mother was right when she advised him to buy the bicycle, but an interest rate of 87% per year is very high. Would you vote with Bill's mother on this question?

Questions to Discuss and Problems to Solve[1]

1. Mr. Lewis bought a second-hand typewriter on the installment plan. By this plan the typewriter cost him $80. He paid $20 down and $12 a month for 5 months. The machine was marked "$72 cash." What rate of interest did he pay per year?

In solving think: Interest ($80 – $72) is $_?_.
In the first month he owed $72 – $20, or $_?_.
In the second month he owed $52 – $12, or $_?_.
In the third, fourth, and fifth months he owed $28, $16, and $4.

He paid $8 on a principal of _?_ dollars for 1 month, or on a principal of _?_ dollars per year. The interest per year is _?_%.

2. Mrs. Draper can buy a mattress and springs for "$60 cash," or for $20 down payment with $7.50 a month for 6 months. Find what rate of interest per year she would be paying if she bought the mattress and springs on the installment plan. If Mrs. Draper arranged to pay the cash price of $60 plus a $1 carrying charge for 60 days of credit, what rate of interest per year would she be paying?

John Mills, Jr., from Frederic Lewis

3. The Adams family can buy a chair for their living room, marked "$40 cash," by making a down payment of $8 and four monthly payments of $9 each. What rate of interest per year would they be paying if they bought the chair on the installment plan?

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[1] To the Teacher. It is desirable that each student solve at least one problem in this list. The complete solutions of several problems done by the class working as a unit may with profit be recorded on the blackboard. Needless to say, members of the class should be encouraged to collect problems which they meet.

4. The Wilson family bought a second-hand car marked "$900 cash" by making a down payment of $100 and 12 monthly payments of $75 each. What is the interest rate per year?

5. The boys on the Tigers Baseball team bought new suits at the beginning of the season. They paid $42 down payment and $15 a month for 6 months. The cash price of the suits was $120. What interest rate per year did the boys pay?

6. From newspapers and magazines select about six advertisements of "bargains" involving installment buying. Here is a sample: "A second-hand radio marked '$30 cash' may be bought by paying $3 down and $3 per week for 10 weeks."

When each advertisement has been read aloud or written on the blackboard, each student records in a notebook his *guess* for the answer to this question: "What is the rate of interest per year which a buyer would pay?" Now each student computes the interest rate by the method already taught in this unit and checks against his estimate.

7.* Study the consumer credit plans of several business places in your community. Credit plans for sales of automobiles, furniture, farm implements, household appliances, and jewelry may be studied by committees of your class. Include in your study the influence of government regulations on the plans.

8. The following table gives the number of million dollars of installment sales of certain items for the years indicated. Use 1933 as the base year and compute index numbers for each of the other years.[1]

		AUTOMOBILES	DEPARTMENT STORES AND MAIL ORDERS	FURNITURE	HOUSEHOLD APPLIANCES	ALL OTHERS
(*a*)	1933	459	119	299	119	126
(*b*)	1936	1289	256	406	235	230
(*c*)	1939	1267	377	536	273	339
(*d*)	1942	482	252	440	188	255
(*e*)	1945	227	198	296	51	170
(*f*)	1948	1961	874	750	387	556
(*g*)	1951	4039	1186	971	613	737
(*h*)	1952	3957	1063	891	542	653

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[1] TO THE TEACHER. If the students need help in the use of index numbers, they should review pages 31 to 36 in Unit I.

A formula helps in computing the rate of interest on installment credit.

Instead of finding the principal for each month as we did in the problem of Bill's bicycle, we can use the average principal for the contract period to compute the rate of interest per year. The use of the average principal enables us to employ an *average principal formula* for finding interest rates on installment credit.

The formula is $r = \dfrac{24\,I}{n(f + l)}$

in which I = amount of interest on charges[1]
n = number of payments
f = principal owed the first month of the contract
l = principal owed the last month of the contract

(1) Let us apply the formula to Bill's bicycle contract. The bicycle was marked "\$42.50 cash" and Bill bought it by paying \$15 down payment and \$8 each month for 4 months. Therefore, interest (I) = \$4.50; number of payments (n) = 4; initial principal (f) = \$27.50; final principal (l) = \$27.50 − (3 × \$8) = \$3.50. (NOTE. To get the final principal, subtract 3 payments from the initial principal.)

SOLUTION. Write the formula: $r = \dfrac{24\,I}{n(f + l)}$

Substitute known values: $r = \dfrac{24 \times 4.50}{4(27.50 + 3.50)} = \dfrac{108}{124}$

And $r = .87$ or 87%

(2) Now use the new formula to solve this one.

What is the rate of interest per year if you buy an ice refrigerator for \$26 down and \$10 per month for 6 months when the cash price is \$77? In this case: $I = \$86 - 77 = \$9$; $n = 6$; $f = \$77 - \$26 = \$51$; $l = \$51 - (5 \times \$10) = \$1$.

SOLUTION. Write the formula: $r = \dfrac{24\,I}{n(f + l)}$

Substitute the known values: $r = \dfrac{24 \times 9}{6(51 + 1)} = \dfrac{216}{312}$

And $r = .692$ or 69%

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[1] TO THE TEACHER. If the interest I is greater than the monthly payment, the final principal l will be a minus value. This means merely that all of the last payment and part of the next-to-the-last payment are interest payments — the principal has been paid up. Under such conditions, l may be considered equal to zero. For all practical purposes, the computed rate will be close enough to the true rate.

* If you know a little algebra, you may be interested in seeing how the installment-rate formula is developed. Follow the steps in the development below.

Step 1. Write the fundamental interest formula $I = prt$. Since rate of interest is the thing that is wanted, divide both sides of the formula by pt. This gives $\frac{I}{pt} = r$, or $r = \frac{I}{pt}$.

Step 2. To find the *average principal* owed throughout the period of contract, take the principal (f) owed the first month, add the principal (l) owed the last month, and divide by 2. That is $p = \frac{f + l}{2}$.

Step 3. The time t for figuring annual interest is in years, but the payments are made monthly. If there are n monthly payments in the period of contract, the total time of contract in years will be $\frac{n}{12}$. That is $t = \frac{n}{12}$.

Step 4. Substitute values for p and t in the formula for rate in Step 1.

Then $r = \frac{I}{pt} = \frac{I}{\left(\frac{f+l}{2}\right)\left(\frac{n}{12}\right)}$.

Step 5. Simplify the denominator as follows:

$$\left(\frac{f+l}{2}\right) \times \left(\frac{n}{12}\right) = \frac{n(f+l)}{24}$$

Then
$$r = \frac{I}{\frac{n(f+l)}{24}}$$

Step 6. Multiply both numerator and denominator of the right-hand side of the equation by 24.

Thus
$$r = \frac{24}{24} \times \frac{I}{\frac{n(f+l)}{24}}$$

And
$$r = \frac{24\,I}{n(f+l)}$$

Harold M. Lambert from Frederic Lewis

Problems to Solve

Compute the rate of interest on each of the following installment purchases, using the average principal formula,

$$r = \frac{24\,I}{n(f + l)}$$

1. A stove for $230 cash, or $50 down and $12 a month for 16 months.

2. A coat for $40 cash, or $15 down and $5 a month for 6 months.

3. A suite of dining-room furniture for $168 cash, or $35 down and $16 a month for 9 months.

4. A watch for $28 cash, or $10 down and $7 a month for 3 months.

5. Four tons of coal for $65 cash, or $21 down and $10 a month for 5 months.

6. A piano for $239 cash, or $48 down and $14 a month for 15 months.

7. A second-hand car for $720 cash, or $240 down and $60 a month for 10 months.

Business and government use the constant ratio formula.

Every method for computing interest on installment buying is based on one or more assumptions. The two methods already explained are based on the assumption that the interest is paid out of the last installment (or the last two installments where interest exceeds monthly payment). The *constant ratio formula,* commonly used by business firms, is based on these three assumptions:

(1) The down payment, if any, is subtracted from the cash price and the unpaid balance is taken as the original principal.

(2) All payments are of the same amount.

(3) The ratio of principal to interest in each payment is the same as the ratio of original unpaid balance to total interest. (EXAMPLE. Original unpaid balance is $90 and total interest is $10; the ratio of principal to interest is therefore 9 to 1. If each payment is $10, and the 9-to-1 ratio is maintained, $9 of each payment is applied to the principal and $1 is applied to interest.)

Because of this constant ratio of principal to interest, businessmen call the formula for the rate of interest the "constant ratio formula." An equation showing that two ratios are equal is called a *proportion.* Therefore, this method for computing rate of interest is sometimes called the "proportionate" method.

The formula[1] is $r = \dfrac{2\,mI}{B(n+1)}$

in which r = rate per year expressed as a decimal fraction

m = number of payment periods in one year. (If payments are monthly, m is 12; if weekly, m is 52.)

I = total carrying charge, or total interest, in dollars

B = unpaid balance at the beginning of the credit period (the cash price less any down payment)

n = number of payments called for in the credit terms, not counting the down payment

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[1] TO THE TEACHER. Some of your students may find this material hard going. It is introduced because the formula is widely used. Ability to use the formula, however, may be the chief accomplishment of certain students.

Let us see how the constant ratio formula is used in solving problems.

(1) Mr. Mason wished to purchase an electric refrigerator which cost \$190, but he had only \$100 in cash. He decided that he could buy more cheaply by obtaining a loan from a finance company than he could by buying from the dealer on the installment plan. So he borrowed \$90 from a local loan company. The interest charges were \$10. He paid the loan and interest in 10 monthly payments of \$10 each. What annual rate of interest did he pay?

SOLUTION. $m = 12$ (since payments are monthly); $I = \$10$ (carrying charge, or interest); $B = \$90$ (the amount of principal owed — no down payment); $n = 10$ (the number of installment payments).

Write the formula: $r = \dfrac{2\,mI}{B(n+1)}$

Substitute known values: $r = \dfrac{2 \times 12 \times 10}{90(10+1)}$

Then $r = \dfrac{240}{990}$

Or $r = \underline{\ ?\ }\%$

(2) A jewelry store offered a famous make of wrist watch for \$35 on time payments, or \$30 cash; \$10 down payment was required. The customer paid \$1.25 a week for 20 weeks. Horace Roscoe thought that he could afford \$1.25 a week to buy one of the watches. What was the annual interest rate that he would have to pay?

SOLUTION. $m = 52$ (payments are weekly); $I = \$35 - \$30 = \$5$ (carrying charge); $B = \$30 - \$10 = \$20$ (unpaid balance at outset); $n = 20$ (number of installment payments)

Write the formula: $r = \dfrac{2\,mI}{B(n+1)}$

Substitute known values: $r = \dfrac{2 \times 52 \times 5}{20(20+1)}$

Then $r = \dfrac{520}{420}$

Or $r = \underline{\ ?\ }$ 42 %

* The development of the constant ratio formula is not hard. And if you know a little algebra, you may wish to derive the formula as indicated in the development below.

Step 1. Remember the fundamental interest formula $I = prt$, or as it is used here, $r = \frac{I}{pt}$.

Step 2. We need to find the average principal owed for the period of the contract. Let B = number of dollars in principal owed in first period and n = number of payments. Then $\frac{B}{n}$ = part of each payment used to reduce the principal, and therefore represents the principal owed in last period.

Average principal $p = \frac{1}{2}\left(B + \frac{B}{n}\right)$, or $\frac{B}{2n}(n+1)$.

Step 3. Let m equal the number of payment periods in a year. Then, if there are n payments in all, the time t (in years) for the period of the contract is $\frac{n}{m}$.

Step 4. Substitute in the fundamental formula the values for p and t as obtained in Steps 2 and 3.

Then $$r = \frac{I}{pt} \quad \text{becomes}$$

$$r = \frac{I}{\frac{B}{2n}(n+1)\left(\frac{n}{m}\right)}$$

Step 5. Simplify the denominator to obtain

$$r = \frac{I}{\frac{B}{2m}(n+1)}$$

Step 6. Multiply both numerator and denominator of the right-hand side of the equation by $\frac{2m}{2m}$.

Thus $$r = \frac{2m}{2m} \times \frac{I}{\frac{B}{2m}(n+1)}$$

And $$r = \frac{2mI}{B(n+1)}$$

Questions to Discuss and Problems to Solve

1. Perhaps you have noted that the rate of interest obtained by using the *constant ratio formula* is not always exactly the same as the rate obtained by using the *average principal formula.* Some concerns prefer one and some prefer the other. Can you account for the difference?

Use the constant ratio formula to find the interest rate on the following purchases:

2. A violin priced at $120 cash was sold for a down payment of $40 and 10 monthly payments of $9. Compute the rate of interest per year.

3. Mr. Monroe found that he could buy a suit on the following terms: Cash price, $50; down payment, $20; carrying charge, $5; monthly payments, $10 each for 3 months. What annual rate of interest would he pay?

4. A bicycle could be bought for $40 cash, or on time payments. The down payment would be $12 and the balance could be paid in 4 equal monthly payments of $8. Compute the annual rate of interest.

5. A five-piece set of furniture at $200 cash, or $40 down payment and 9 monthly payments of $20 each was bought on the time plan. What annual rate of interest was paid?

6. A mail-order store permits installment payments on any order totaling $10 or more. Use the constant ratio formula to compute the rates charged on the following orders (no down payments).

	AMOUNT OF ORDER (B)	CREDIT CHARGE (I)	AMOUNT OF MONTHLY PAYMENT	INTEREST RATE
(*a*)	20	1.50	$5	
(*b*)	35	3.30	5	
(*c*)	50	4.50	5	
(*d*)	60	6.00	6	
(*e*)	70	6.50	7	
(*f*)	90	8.50	9	
(*g*)	150	14.25	15	

7. The Selzal Store has a plan whereby the customer can add up a number of small purchases and pay the total on the installment plan. If a person bought $50 worth of goods and paid $20 down and $8 a month for 4 months, what was the annual rate of interest?

8. A stove priced at $96 cash was sold for $30 down and 7 monthly payments of $10. What is the interest rate per year?

You may estimate approximate interest rates on installment credit.

Sally: Miss Hill, I don't believe these things we've learned about installment buying are ever going to do us much good.

Miss Hill: Why do you say that, Sally?

Sally: Well, Dad is planning to give Mother a refrigerator for Christmas; so they went shopping for one last Saturday. They found that they could buy refrigerators on installments at several stores.

Sally's parents are interested in buying a refrigerator.

Ewing Galloway

They took down the information at each store and brought all the data home. I wanted to help them find the various rates of interest charged by the different stores. But all the methods you have taught us were too difficult to figure out in my head, so I sat down by myself and computed the rates. It took considerable time to do all the figuring, and I don't believe the average person will ever go to all that trouble.

Miss Hill: Perhaps you are right, Sally. Can you think of some way to overcome this difficulty?

Sally: If there were some way of estimating the approximate rate, I could easily make comparisons that are close enough.

Miss Hill: That's a good idea, Sally. Let's see if we can develop such a method. Suppose we start with a problem on one of the refrigerators they looked at.

Sally: Here is one refrigerator which sells for $190 cash, and can be bought on time by paying $30 down and 18 monthly payments at $10 each.

Miss Hill: These are the steps for estimating the rate of interest on an installment purchase:

Step 1. Find the amount of the cash price that must be paid by installments. In our problem the cash price is $190. Of this $30 is paid, leaving an unpaid balance of $160.

Step 2. Assume that half the amount which must be paid by installments is the average principal owed throughout the contract period.[1] In our problem the average principal is $\frac{1}{2}$ of $160, or $80.

Step 3. Estimate the quotient obtained by dividing the interest by the average principal. In our problem the interest is $\$30 + (18 \times \$10) - 190 = \$20$. And $\frac{20}{80} = \frac{1}{4}$ or 25% for 18 months, or about $1\frac{1}{3}$% a month. This is equal to $12 \times 1\frac{1}{3}$, or about 16% a year.

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[1] To the Teacher. The reasonableness of this assumption in finding an estimated interest rate can be shown by referring to development of the average principal on page 152.

Now let's try another example from this furniture advertisement.

A suite of furniture sells for \$165 cash or for \$35 down and 8 monthly payments of \$18 each. Find the approximate rate of interest by the "estimate method."

Step 1. \$165 − \$35 = \$130

Step 2. \$130 ÷ 2 = \$65

Step 3. Interest is \$35 + (8 × \$18) − \$165 = \$14. And $\frac{14}{65}$ is less than $\frac{15}{60}$ ($\frac{1}{4}$) and slightly more than $\frac{12}{60}$ ($\frac{1}{5}$), or less than 25% and slightly more than 20%. Let us say 22% for 8 months or approximately $2\frac{3}{4}$% a month. This is equal to 12 × $2\frac{3}{4}$ or 33% a year.

Problems to Solve

1. For each purchase find the interest rate by the estimate method; then find the rate by the formula: $r = \frac{2\,mI}{B(n+1)}$.

	Cash Price	Down Payment	Size of Each Payment	Number of Monthly Payments
(*a*)	\$72	\$17	\$6	10
(*b*)	99	20	14	6
(*c*)	32	8	7	4
(*d*)	46	10	14.50	3
(*e*)	25	5	12	2
(*f*)	160	60	15	8
(*g*)	230	50	23	9
(*h*)	100	35	8	10

2. A deep-well pump at \$65 cash, or \$22 down and 6 monthly payments of \$8 each.

3. A wrist watch at \$30 cash, or \$10 down and \$6 for 4 months.

4. A hot-water heater at \$144 cash, or \$40 down and \$10 a month for 12 months.

5. A bicycle for \$42 cash, or \$12 down and \$7 a month for 5 months.

6. A cornet for \$70 cash, or \$24 down and \$6 a month for 9 months.

PROBLEM III

What Points Must You Consider When You Borrow from a Small Loan Company?

Bill was waiting impatiently when Joe arrived at school. "I've found out how we can borrow the money to buy that boat Fred Harris said he'd sell us for $25," Bill announced.

"What's your plan?" Joe asked not too enthusiastically as he kicked idly at a loose stone.

"I've been reading about personal installment loans. It seems that there are places where you can borrow small amounts and pay the money back as you earn it. These places are called 'small loan companies' because they make loans of only small amounts of money. Let's go downtown Saturday morning and see if we can borrow $25 at one of the small loan companies."

"Suits me. We could pay it back with the money from our paper routes," Joe agreed.

So Saturday morning the boys went to see Mr. Dillon in the Valley Small Loan Company. They told him at once how much they wanted and for what.

The first question Mr. Dillon asked the boys was, "Do you have any *collateral* to offer?"

Joe asked, "What do you mean by collateral?"

"I mean, do you have anything worth $25 that you would promise to let us sell if something happened to the boat and if you didn't pay back the money?" Mr. Dillon explained.

"I have my bike," both boys replied in unison.

"How old are you?" was Mr. Dillon's next question.

"Sixteen," said Joe.

"Seventeen," said Bill.

"Sorry, boys, but you have to be twenty-one before we can lend you money," Mr. Dillon told them. "Of course, either or both of you might get your fathers to *endorse* for you."

"What do you mean by endorse for us?" asked Bill.

"I mean that your father will have to sign the note under your signatures. His signature below yours means that he promises to pay back the money if you don't," Mr. Dillon told Bill.

That night, when Bill explained to his father what he and Joe wanted to do, Mr. Hale asked him these questions:

(*a*) What is a personal installment loan?

(*b*) What will it cost to borrow the money?

(*c*) Is there a plan for paying the debt?

(*d*) What contracts or agreements have to be signed?

Mr. Hale told Bill that if he and Joe would find the answers to these questions, he would consider endorsing for them.

The answers to these four questions are important to anyone who is thinking about obtaining a personal installment loan.

Personal installment loans are regulated by state and Federal laws.

Bill and Joe discovered that personal installment loans can be readily obtained by most persons. They found that loan companies have been licensed to make small loans for many years. Bill read in a magazine that small loan companies were practically forced into business because so many persons needed to borrow small sums of money to meet emergencies. The Russell Sage Foundation early interested itself in promoting legislation to regulate the personal loan business in the interest of both the lender and the borrower. Although practices still vary from state to state, legislation has made certain regulations fairly uniform among all states having personal loan laws. For example:

(*a*) Generally personal loans do not exceed $500 for any one borrower.

(*b*) Fairly high interest rates prevail to compensate the lender for the high cost of making and collecting installment loans. Some states permit interest rates as high as $3\frac{1}{2}\%$ a *month.* The usual rate is 2 or $2\frac{1}{2}\%$ a *month.*

(*c*) Interest is charged only on unpaid balances.

(*d*) Collateral is frequently though not always required on personal loans.

Questions to Discuss and Things to Do

1. *How does a small loan company operate?* Find out if there is a small loan office in your community. If there is, get permission for your class to visit the office and observe how it operates. These are some of the questions for which you might like to find answers:

(*a*) What rate of interest is charged?

(*b*) What is the average size of the loans made?

(*c*) What is the average length of time for which loans are made?

(*d*) Is collateral required? If so, what kinds of property are most frequently used to secure the loans?

(*e*) In what per cent of the loans made has the company had to sell the property in order to collect?

(*f*) How many persons constitute the office personnel and how is the work divided among them?

(*g*) What is the routine procedure in making a loan, from application to completion?

(*h*) Where does the office have its state license displayed?

If there is not a small loan office in your community, you might invite a representative from an office in a near-by community to visit your class and discuss your questions.

2. *Why do some states not have a small loan law?* If you live in a state where there are no small loan offices, you might like to investigate with your class to find out the cause of this situation. Here are some questions for you to study:

(*a*) What is the maximum legal rate of interest in your state?

(*b*) What procedure is necessary in order to change this law?

(*c*) Have there been any efforts made to change this law? If so, why did they fail?

AUTO LOANS
MOTORS FINANCE CO.
Giant

Ewing Galloway

Some loan companies specialize in making automobile loans.

Various rates are charged for personal loans.

Here is a suggested arrangement of work in a table for finding the cost of installment loans. It shows how charges are figured on a $100 loan repaid in 10 monthly installments at the rate of 3% a month on unpaid balances.[1]

AT END OF MONTH	PAID ON PRINCIPAL	CHARGE	MONTHLY PAYMENT	BALANCE
1	$ 10.00	$3.00	$ 13.00	$90.00
2	10.00	2.70	12.70	80.00
3	10.00	2.40	12.40	70.00
4	10.00	2.10	12.10	60.00
5	10.00			50.00
6	10.00			40.00
7	10.00			30.00
8	10.00			20.00
9	10.00			10.00
10	10.00			
Total	$100.00	$16.50	$116.50	

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[1] TO THE TEACHER. This is an example of charges that would be made according to the small loan law existing in a certain state. There is still considerable variation in the laws regulating charges among several states. It is suggested, therefore, that students may be directed to find if and how this problem would be changed by the law in their own state.

Questions to Discuss and Problems to Solve

1. In the table on the preceding page how are the amounts in the "Charge" and "Monthly Payment" columns computed? Now make a copy of this table in your notebook and then fill in the blank spaces.

***2.** In one state the law permits interest rates of $3\frac{1}{2}\%$ on the first \$100 of a loan, and $2\frac{1}{2}\%$ on all above \$100. Make a table like the one in Ex. 1, showing the charges made at these rates on a loan of \$200 paid back in 10 monthly payments of \$20 each, plus interest on unpaid balance.[1]

***3.** If you borrow \$60 for 12 months at the rate of 3% per month and pay back \$5 plus interest on unpaid balance each month, what will be the total charges on the loan? What rate of interest per year do you pay?

***4.** If you secure a loan of \$120 for 12 months at the rate of $2\frac{1}{2}\%$ per month and pay back \$10 each month plus interest on unpaid balance, what will be the total charges on the loan? What rate of interest per year do you pay?

5. Now you are ready to answer one of the questions Mr. Hale asked Bill. Assume that Bill and Joe want to borrow the \$25 for their boat for 5 months and the interest rate is 3% per month. How much of the principal will they have to pay back at the end of each month? What will be the total charges? What will be the total amount paid? What, then, is the *average* amount these boys will have to take from their paper-route earnings each month to pay on the loan? What is the maximum amount these boys will have to pay for one month? the minimum amount?

***6.** Some small loan companies lend money at rates less than the maximum allowed by law. One such company charges $2\frac{1}{2}\%$ per month on all loans, although the law permits 3% on loans up to \$100. On a loan of \$80 for 10 months, how much would you save by borrowing from this company rather than from a company that makes the maximum charge of 3%?

---

[1] To the Teacher. At this stage, students are likely to suggest good problems in place of the optional problems given in the text.

A short method may be used to find the cost of a personal loan.

Here is an example showing how charges are figured on a $120 loan from a small loan company to be repaid in 12 monthly installments of $10 each plus interest at the rate of $3\frac{1}{2}\%$ per month on unpaid balances. The first two lines are completed to illustrate the method of computation.

AT END OF MONTH	PAID ON PRINCIPAL	INTEREST CHARGE	MONTHLY PAYMENTS	BALANCE
1	$ 10.00	$4.20	$14.20	$110.00
2	10.00	3.85	13.85	100.00
3	10.00			90.00
4	10.00			
5	10.00			
6	10.00			
7	10.00			
8	10.00			
9	10.00			
10	10.00			
11	10.00			
12	10.00			
Total	$120.00			

(1) When you have studied the table to find out how the amounts in the last three columns are computed, complete the table by filling in the blank spaces.

(2) At the $3\frac{1}{2}\%$ per month rate used in Ex. (1), the yearly rate is 42%. The total interest charge for the 12 months is _?_. This charge is 42% of what amount?

(3) There is a short way of finding charges on the loan mentioned above. Here is how it works:

Find the average of the $120 owed the first month and the $10 owed the last month. This may be considered the average amount owed during the 12 months. Now find 42% of this average amount. Compare your result with that obtained by the long method which was used in Ex. (1).

(4) Express in the form of a rule this short method of finding the charges on a small loan.

Now use the rule to solve these two examples:

(*a*) Mr. James borrowed \$100 from a small loan company and paid it back in 10 monthly installments, plus interest at the rate of 3% per month. The average of the amount he owed the first and last months is _?_. Thirty per cent of this amount is _?_, which is the total of his charges on the loan. In this case the loan is made for less than a year. Will you have to revise your rule to cover cases like this?

(*b*) Using the rule you have developed, find the total charges on a loan of \$150 from a small loan company, paid back in 10 monthly installments, plus interest at the rate of $2\frac{1}{2}$% per month on unpaid balances.

(5) Your rule can be expressed by this formula:[1]

$c = nra$

in which $c =$ total charges

$n =$ number of monthly payments

$r =$ interest rate per month (as a decimal)

$a =$ average of the principal owed the first and last months

Use the formula to find the total charges on a loan of \$80 paid in 10 monthly installments of \$8 each plus interest on unpaid balances at a rate of $3\frac{1}{2}$% per month.

Here principal owed the first month is \$80 and principal owed the last month is \$8; and $a = \frac{80 + 8}{2} = \$44$.

SOLUTION. Write the formula: $c = nra$

Substitute: $n = 10$; $r = .035$; and $a = \$44$

Then $c = 10 \times .035 \times 44$

and $c = \$15.40$

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[1] TO THE TEACHER. Some students may observe that this is the same formula as $r = \frac{24\,I}{n(f + l)}$ developed earlier. I is the same as c, n is the same in both formulas, while r in the earlier formula expresses rate per year and r in the present formula is rate per month. Moreover, in the development of the first formula, we had to use $\frac{f + l}{2}$, which here is a.

Problems to Solve

Use the formula you have just developed to find the charges on the following loans:

1. A $150 loan repaid in 10 monthly payments at $3\frac{1}{2}\%$ a month on unpaid balances.

2. A $60 loan repaid in 5 monthly payments at $2\frac{1}{2}\%$ a month on unpaid balances.

3. A $120 loan repaid in 12 monthly payments at 3% a month on unpaid balances.

4. A $90 loan repaid in 5 monthly payments at $3\frac{1}{2}\%$ a month on unpaid balances.

5. A $140 loan repaid in 7 monthly payments at 2% a month on unpaid balances.

6. A $75 loan repaid in 3 monthly payments at $3\frac{1}{2}\%$ a month on unpaid balances.

7. A $40 loan repaid in 5 monthly payments at 3% a month on unpaid balances.

8. A $240 loan repaid in 15 monthly payments at $2\frac{1}{2}\%$ a month on unpaid balances.

Using a level-payment method to repay a loan.

Some small loan companies permit the borrower to pay off his loan and interest in equal monthly payments. This method of payment is called a *level-payment method.* Since the payments remain equal each month, it follows that there is a decrease in the amount of interest paid and an increase in the amount of principal paid with each payment. It is somewhat more difficult for the borrower to compute his actual interest payments by the level-payment method. Therefore, where this method is used, the loan company furnishes the borrower with a table which shows the monthly payments for various amounts and various periods of time.

COOPER SQUARE
LOAN
SUITS
OVERCOATS
$5.00
UP
COLEM

A. F. Sozio from Gendreau

The miscellaneous display in the pawnshop window is a familiar sight in many cities.

The following table is a condensation of a form that is widely used in offices of small loan companies. The rates on which the amounts are based are 2½% per month for the first $100 of a loan and 2% on all above $100 up to $300. Actual tables contain much more detail as to number of monthly payments and amounts borrowed.

NUMBER OF MONTHLY PAYMENTS	CASH BORROWED AND MONTHLY PAYMENTS				
	$75	**$100**	**$150**	**$200**	**$300**
18	$5.23	$6.97	$10.39	$13.76	$20.46
15	6.06	8.08	12.05	15.98	23.80
12	7.31	9.75	14.56	19.33	28.82
9	9.41	12.55	18.75	24.92	37.21
6	13.62	18.15	27.16	36.13	54.02

Problems to Solve

1. From the level-payment table you find that for a loan of $200 for 9 months the equal monthly payments are _?_. Therefore, 9×24.92 = $_?_ is the total paid to the company by the borrower. Then $224.28 – $200.00 = $_?_ is the amount of the charges on the loan. Show that the charges on this loan if it was made for 12 months would be $31.96.

2. Use the level-payment table to find the total charges on the following loans:

(*a*) $150 for 6 months
(*b*) 75 for 15 months
(*c*) 200 for 9 months
(*d*) $100 for 6 months
(*e*) 300 for 18 months
(*f*) 100 for 12 months

3. Use the level-payment table to find the average monthly charge on the following loans:

(*a*) $150 for 15 months
(*b*) 100 for 6 months
(*c*) 75 for 12 months
(*d*) $200 for 18 months
(*e*) 300 for 9 months
(*f*) 75 for 6 months

Plans should be made to pay off the loan.

It is easy to borrow but hard to repay. The general tendency is to go deeper and deeper into debt. Everything possible should be done to avoid this condition by constructing a plan to pay off a debt.

As an optional study it may be interesting to some members of your class to go back to our earlier problem and see if our friends Bill and Joe were operating on a sound plan. You will recall that each boy depended on the profit of his paper route for the money needed to repay the $25 they wanted to borrow in order to buy a boat.

Questions to Discuss and Things to Do

1. The boys looked at the record of their sales for the past three months. Bill had 83 customers for January, 82 for February, and 87 for March. There were 5 collection days for January, 4 for February, and 4 for March. His profit on each customer is $8\frac{1}{2}$ cents per week. What was his total income for the three months? What was his average income per month? What was his average number of customers per month?

2. Joe had 69 customers in January, 68 in February, and 67 in March. His profit each week is $8\frac{1}{2}$ cents per customer. What was his total income for the three months? his average income per month? his average number of customers per month?

3. The boys realized that many persons are away on vacation during July and August. They estimated that their incomes in July might be only 80% of their average monthly income for January, February, and March; and in August might be only 75% of their average monthly income. Bill estimated that he would earn about _?_ cents in July and _?_ cents in August. Joe estimated that he would earn _?_ cents in July and _?_ cents in August.

4. Complete the table on page 173, showing in cents each boy's estimate of his future earnings. They estimated that their earnings for each of the months of April, May, and June would equal their average monthly earnings for January, February, and March.

	APRIL	MAY	JUNE	JULY	AUGUST	AVERAGE PER MONTH FOR FIVE MONTHS
Bill's						
Joe's						

5. You will recall that the boys were planning to borrow $25 for 5 months and that each month they would need to pay $5 plus 3% monthly interest on the unpaid balance as shown in this table:

	PRINCIPAL OWED	PAYMENT ON PRINCIPAL AT END OF MO.	INTEREST PAID AT END OF MO.	TOTAL PAYMENT
1st mo.	$25	$ 5	$ .75	$ 5.75
2nd mo.	20	5	.60	5.60
3rd mo.	15	5	.45	5.45
4th mo.	10	5	.30	5.30
5th mo.	5	5	.15	5.15
Total		$25	$2.25	$27.25

If each boy is to pay half the cost of the loan, what is the largest amount that each boy will need to pay in any one month? the least?

6. Bill and Joe estimated that their expenses each month for the next five months would be about as follows:

EXPENSES	BILL	JOE
Clothing	$3.25	$3.00
Club dues	.25	.25
Bus fare	2.00	2.00
Recreation	1.25	1.00

From their estimated average income, their expenses would leave the boys together __?__ per month to apply to the loan they wanted to secure. Do you think these boys have a sound program for paying their debt?

$ 100/00

NOTE

No.

Richmond, Ohio, Nov. 15 19 53

1. FOR VALUE RECEIVED, the undersigned jointly and severally promise to pay to THE STATE LOAN COMPANY A SMALL LOAN CORPORATION (hereinafter called the Corporation) or order One Hundred and 00/100 Dollars, the actual amount of money this day loaned to the undersigned, with interest on unpaid daily balances of 2% per month, payable at its licensed office, 513 Park View Ave., S. E. Richmond, Ohio, in 10 successive monthly installments * with interest as follows:

$ 10 per month for 10 months hereafter

$ per month for the succeeding months and

$ per month for the succeeding months

the first installment to be due and payable on the 15th day of December 19 53. The final installment shall be due the 15th day of September 19 54. (In no event shall date of final payment be more than (20) months from date of execution of this note. This provision is controlling regardless of what may be inserted in writing herein.) From each payment hereon, interest at said rate on the unpaid daily balances of the amount loaned shall first be deducted and the remainder of such payment shall be applied on the unpaid principal of this obligation, until paid, resulting adjustments, if any, shall be made in the said final installment. If this note is not paid as agreed it shall bear interest in addition to that provided above for an additional period of (3) months only at said rate and thereafter it shall bear interest at 6% per annum only.

2. The principal amount hereof may be paid at any time with interest at the above rate to the date of payment.

3. In case of default in the payment of any installment and interest, either or both, as the same becomes due, or should the maker or makers remove, sell, or transfer or attempt to remove, sell or transfer any property on which a lien has been given to secure the payment of this indebtedness without first obtaining the written consent of the holder of this note, the entire unpaid indebtedness including interest as above provided, shall at the option of the holder hereof, immediately become due and payable without notice thereof.

4. Each of the undersigned hereby assents to the subsequent addition of any signature above or below a signature.

5. The above loan has been made, and this note has been made, executed and delivered at the licensed office of the Corporation at the above address.

6. We acknowledge receipt of a statement of loan from the Corporation as required by the small loan law, upon which also is printed in English a copy of the rate section as required by said loan law.

7. Each maker and endorser of this note hereby waives presentment, demand and notice of dishonor, the benefits of homestead exemption as to this debt, and agree to remain bound for payment of same notwithstanding any extension or extensions of time of payment.

8. That wherever the word "we" or "our" or "us" is used herein, it shall be construed to mean the undersigned jointly and severally; also it shall apply to the singular person, if this obligation is signed by one person. Witness our hands and seals.

Helen Smith Witness	John Q. Citizen (L. S.)
Helen Smith Witness	Laura M. Citizen (L. S.)

* Fill in the word "with" or "including" as the case may be.

The lender gives a note to obtain a personal installment loan.

Too many persons sign legal forms without realizing what they are doing. A ***promissory note*** is a good example of a legal paper you should understand. A copy of one used by a small loan company is printed on the opposite page. It is good experience for you to read this form and to answer the questions that follow. This kind of agreement is similar to the one Joe and Bill would have to sign before they could borrow money for their boat.

Questions to Discuss and Problems to Solve

1. What is the actual amount of the loan? In how many places does this amount appear in the note?

2. How much is each monthly payment? When is the first one due?

3. If payments are made according to schedule, how many payments will be made?

4. How much will this loan of $100 cost Mr. and Mrs. Citizen?

5. If this loan had been made for $200, would the monthly charges be equal to, greater than, or less than twice as much as the charges made on this $100 loan? Why?

6. Is there any indication that the loan company may extend the time of the loan beyond September 15, 1954? Can Mr. and Mrs. Citizen compel the company to make this extension?

7. How can Mr. and Mrs. Citizen be sure the finance company is operating according to the laws of the state?

8. Have you ever heard of a person, outside your family and outside your circle of acquaintances, who signed a legal paper that resulted in tragic consequences?

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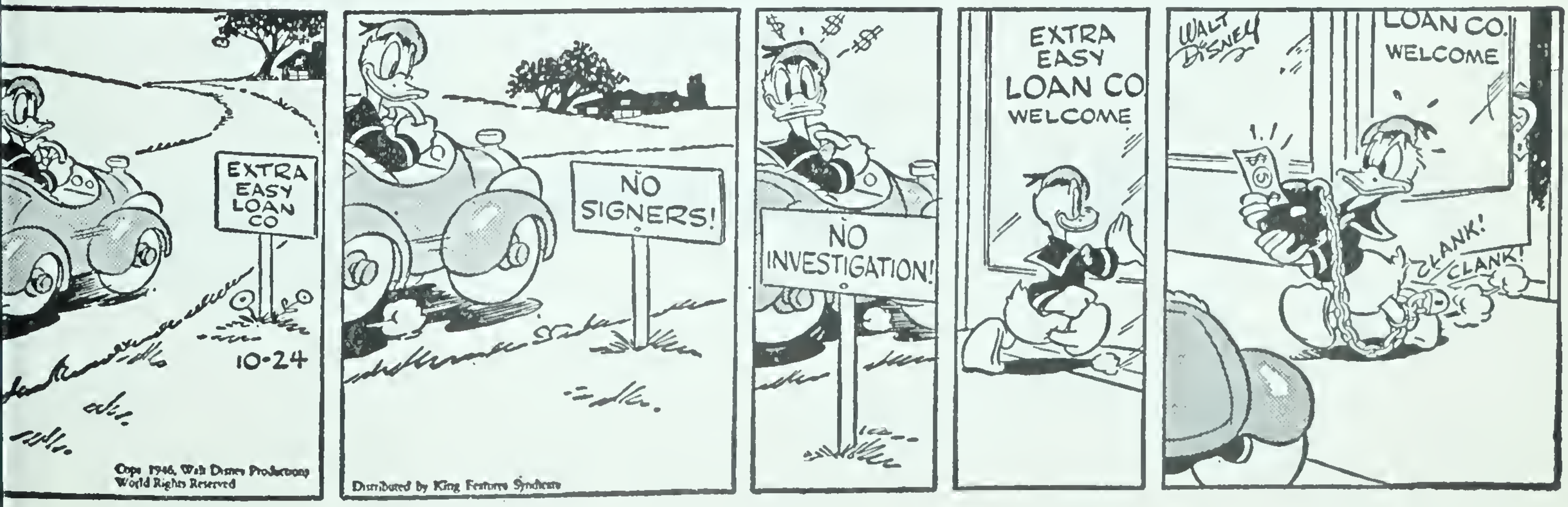
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LOAN CO. WELCOME
CLANK! CLANK!

PROBLEM IV

What Is the Cost of a Bank Loan? *

Ann: Do you know that many of the automobiles sold today are sold on credit, and that the buyer pays an interest rate from 12% to 25%? This is true for both new and used cars.

Mary: Yes, I do. Dad says that really very few cars which were sold on time cost as little as 12% per year for carrying charges.

Ann: You wouldn't have to pay that high a rate now.

Mary: I guess you'd have to.

Ann: No, I wouldn't; I'd borrow from a personal loan department in a bank. I saw an advertisement this morning that said, "The cost of borrowing through this bank is only $6 per $100 per year."

Mary: Why, that's an annual interest rate of only 6%. I wonder if Miss Hill, our mathematics teacher, knows about this type of loan.

Miss Hill did know about bank loans. She told Ann that a careful study of the advertisement would show that the annual rate of interest was nearer 12% than 6%. She said that banks could not afford to make small loans at a 6% rate. The total cost of making a small installment loan is usually as large as or greater than the total cost of making a single-payment loan. There is more expense in investigating and bookkeeping for the small installment loan.

Miss Hill used a loan of $600 as an example in order that the computation might be simple.

Interest charged on $600 at $6 per $100 per year = 6 × $6 = $36 per year.

Total amount owed = $600 + $36 = $636.

Amount of each of 12 monthly payments = $\frac{\$636}{12}$ = $53.

Of this monthly payment, $50 goes to reduce the principal of $600 and $3 goes to pay the total interest of $36.

Using the installment formula:

$$r = \frac{2\,mI}{B(n+1)}$$

$$m = 12; \quad I = 36; \quad B = \$600; \quad n = 12$$

$$\text{Therefore, } r = \frac{2 \times 12 \times 36}{600(12+1)} = \frac{864}{7800} = .1108 \text{ or } 11.1\%$$

Robert Yarnell Richie from Frederic Lewis

Many banks have personal-loan departments for making small loans.

Questions to Discuss and Problems to Solve

1. What was Mary failing to take into account when she said that the advertisement Ann found implied an interest rate of only 6%?

2. Banks lend money for many purposes and according to several plans of charging interest. As you work these problems you will learn something about these various practices.

(*a*) The rates for money lent on some articles are higher than the rates for money lent on others. If \$8 per \$100 is the interest charge made, what is the rate of interest on a \$300 loan paid back in 12 monthly installments?

(*b*) Mr. Jacobs used some stock certificates as guarantee that he would repay a loan of \$180 in 12 monthly payments. The charges are \$5 per \$100 when this kind of collateral[1] is used. What annual rate of interest did he pay?

(*c*) Mr. Johnson used his life insurance as collateral for a loan. He found that the charges, with such collateral, were only \$4.50 per \$100 on loans of \$1000 or over. He borrowed \$2400 and paid it back in 12 monthly payments. What rate of interest did he pay?

---

[1] TO THE TEACHER. Although such new words as "collateral" are explained when they are first met, as on page 162, nevertheless reteaching may be needed when they are encountered later.

3. Banks sometimes deduct the interest charges from the loan when it is made. This deduction is called *discount*. If the charges are $6 per $100, a person making a note for $100 gets from the bank only $100 − $6 = $94. Therefore, to compute the interest, a principal of $94 must be used, since this is the actual amount the borrower gets from the bank. If a person makes a $100 note according to these terms, and pays it back in 10 monthly installments, what rate of interest does he pay?

4. Work the following problems by the constant-ratio method.

(*a*) Harry Bell borrowed from a bank to pay his expenses at night school. The bank charged $6 per $100 as interest and $2 per $100 as carrying charges. Harry gave his note for $100 and the bank gave him $92. He paid off the note in 10 equal monthly payments. What rate of interest did he pay?

(*b*) Jack Cross borrowed from a bank to buy a used car. The charges were discounted at the rate of $8 per $100. He made a note for $200 to be paid back in 12 months. Shortly after Jack gave his note, he received a raise in salary, and so he paid off the note in 6 monthly payments. If no interest was refunded, what true rate of interest did he pay? If he was charged $2 for service and received a refund of $6, what rate of interest did he pay?

*(*c*) A workman got a better job in a near-by city. His total expenses for moving were $119.60. To pay off this amount, he borrowed from a bank that charged 8% discount. How large a note did he have to make to get the amount he needed?

(*d*) Compare the interest rates on these two loans:

1. Note for $150 with charges at 8% discounted; principal to be paid in 12 equal monthly installments.
2. Note for $138 (not discounted) plus interest charges at 8%; total principal and interest to be paid in 12 equal monthly installments.

Which of the interest rates is the higher? Is this a fair comparison, since the first note was for $150 and the second one for only $138? Why?

PROBLEM V *

What Do Loans Cost When Consumers Run Their Own Banks?[1]

Are consumers themselves doing anything about credit and savings? The idea of coöperative "baby banks" is spreading very rapidly. These coöperative groups are organized for two purposes: (1) to encourage thrift and (2) to make borrowing possible at reasonable rates. More than two million persons in the United States belong to *credit unions.*

Consumers establish a credit union.

Here is a general description of how a credit union might organize and keep going.

Someone in a group of persons working for a company decides it will help many members of the group to manage their money matters if they have a ***credit union.*** A meeting is called and officers are elected. All the officers, except the one who keeps the accounts, usually serve without pay. The officers appoint a credit committee, a supervisory committee, and an educational committee. The job of the educational committee is to tell both members and non-members how the credit union works and what its advantages are. Generally free office space for conducting the activities of the credit union is provided by the company.

Next, the credit union applies for either a state or a Federal charter. State and Federally chartered unions are the same in basic organization. The only difference is that the business of one is supervised by the state and the business of the other is supervised by Federal inspectors.

A small membership fee (25 or 50 cents) is usually charged new members. Then a member may buy as many shares of stock in the union as he wishes at a predetermined rate (usually $5 or $10 a share). These shares of stock are like deposits in a bank and the money can be withdrawn whenever the shareholder desires.

---

[1] To the Teacher. This problem involves the third case in per cents and is difficult for most students. It is therefore marked as optional.

After a stipulated number of shares have been sold, the credit union is ready to lend money to members. The usual rate of interest on loans is 1% a month on unpaid balances. The credit committee must pass on all loans. The interest paid on loans provides a profit to the union, since there are very few expenses. These profits are distributed to the shareholders in the form of dividends each year. Many credit unions have regularly paid dividends to the members at the annual rate of 6%.

Questions to Discuss and Things to Do

1. What are the two purposes served by credit unions?

2. Deposits of $150,000 daily in credit unions by the 3,000,000 union members in the United States amount to _?_ a year per member. (Assume 300 business days in a year.)

3. In one year, how much do the 1000 new members who join credit unions daily in the United States pay in annual membership dues at 25 cents each?

4. A loss of one dollar per thousand in the credit union loans of the United States is a loss of _?_%.

5. If you own 5 shares worth $10 each in a credit union and the annual dividend rate is 2½%, your dividend check each year amounts to _?_.

6. Interest on loans at "1% a month on the unpaid balance of the loan" amounts to 12% a year. If you borrowed $100 at this rate and repaid the loan in 12 equal monthly payments, how much interest would you pay? (For the solution of this problem, use the short method formula on page 168.)

Jack Thomas says you would pay $12. But Mary Reed says the interest would be $6.50. She says this is correct because the true principal would be a little more than $50 instead of $100. Which answer is correct?

7. Government estimates of millions of dollars of outstanding credit union loans from 1939–1952 are given in this table.

Prepare a graph to show the trend.

YEAR	MILLIONS OF DOLLARS	YEAR	MILLIONS OF DOLLARS
1939	135	1948	312
1942	130	1951	542
1945	103	1952	566

8. List as many reasons as you can why credit unions can afford to charge lower rates of interest than banks or small loan companies.

9. Do you think it is right to exempt credit unions from taxation?

10. Is there a credit union operating in your community? If so, we suggest that you invite a representative to speak to your class and tell you what it does for its members.

Sally Bates organizes a credit union.[1]

Sally Bates is an enterprising senior in Central High School. She works during out-of-school time in a department store. Sally is thrifty and the other salesgirls know that she always has some ready cash. Consequently they annoy her greatly by their frequent requests to borrow money.

When Sally learned about credit unions, she decided to try to organize one among the salesgirls. She thought it would help them save and also relieve her of having to be the personal banker for so many of her friends.

At a meeting that Sally called, the girls elected a board of directors, which in turn appointed a credit committee. Sally, as you may guess, was made treasurer.

---

[1] To the Teacher. The purpose of this section is to provide practice in the computation required in keeping the books of a credit union. Students may find the skill acquired in this section extremely valuable.

Some Problems Taken from Sally's Accounts

1. The girls agreed on a membership fee of 20 cents, and they decided that shares could be bought by the members at $2 each. During the first year 15 girls joined the union and bought 100 shares of stock. Sally's books, then, showed that the capital of the union after one year was ___?___.

2. During the year the union made 12 loans totaling $179.50. The average loan amounted to ___?___.

3. These loans showed on Sally's books like this:

NAME	AMOUNT OF LOAN	MONTHS BORROWED	PAID ON PRINCIPAL EACH MONTH	TOTAL INTEREST PAID
Alma Bates..........	$15.00	3	$5.00	$.30
Ann Bohan..........	12.00	2	6.00	—
Betty Carr...........	22.00	4	5.50	—
Carrie Dunn.........	22.50	3	7.50	—
Dorothy Faro........	25.00	5	5.00	—
Eleanor Gates.......	6.00	1	6.00	—
Elizabeth Horn......	14.00	2	7.00	—
Ellen O'Neil.........	12.00	2	6.00	—
Florence Rocci......	8.00	1	8.00	—
Louise Tare..........	15.00	2	7.50	—
Sally Unaz...........	10.00	2	5.00	—
Virginia Young......	18.00	3	6.00	—
			Total	—

The girls agreed that interest should be paid at the rate of 1% per month on balances due. They also agreed that any fraction of a cent of interest should be counted as a whole cent in computing charges. So here is how Sally computed the interest on Alma Bates's loan of $15 for 3 months, paid back $5 each month.

Balance due first month is $15; interest at 1% = $.15
Balance due second month is $10; interest at 1% = .10
Balance due third month is $5; interest at 1% = .05
Total interest = $.30

Put in the blank spaces in the table the other amounts which Sally had in the "Total Interest Paid" column of her book.

4. You have just found that the total interest paid by the twelve girls was \$3.52. From this we estimate that for the first year the credit union earned a little more than _?_% on the \$200 invested in it by the girls.

5. Sally said she would keep an account of the time she spent making the loans and keeping the books, and charge the credit union 65¢ an hour at the end of the year. How long did it take you to compute the interest on the 12 loans? If Sally's time for making the loans and keeping the books was twice as much as your time for computing the interest, how much money should Sally charge at the end of the year?

6. The girls decided they could afford to declare a dividend of $1\frac{1}{4}\%$ at the end of their first year. How much did Betty, who owned 7 shares, get in dividends? How much did Florence, who owned 12 shares, get? (Drop fractional part of a cent.)

7. At the beginning of the second year five more girls joined the union. Enough additional shares were bought to increase the capital to \$354. More loans were made and some were larger. Sally soon found that the formula $\left(r = \frac{24\,I}{n(f + l)}\right)$ for rates on the installment plan could be used to find the total interest on these larger amounts. This was of considerable help in her bookkeeping. Here is the way she used the formula for a loan of \$40 to be repaid in 8 months at \$5 a month plus interest:

Writing the formula: $r = \dfrac{24\,I}{n(f + l)}$

In this case $r = 12\%$, for 1% per month is 12% per year; $n = 8$; $f = 40$; $l = 5$.

Substituting the known values, $.12 = \dfrac{24\,I}{8(40 + 5)}$

Multiplying both sides by 8×45, $43.20 = 24\,I$

And $I = \underline{\ ?\ }$

8. Use the formula $r = \dfrac{24\,I}{n(f + l)}$ to find the total interest on these loans at the rate of 1% per month:

(*a*) $24 paid back in 4 equal payments
(*b*) $45 paid back in 9 equal payments
(*c*) $35 paid back in 5 equal payments
(*d*) $6 paid back in 2 equal payments
(*e*) $56 paid back in 8 equal payments
(*f*) $16 paid back in 4 equal payments
(*g*) $28 paid back in 7 equal payments

9. At the end of the second year the girls found that the union had enough money to declare a 2½% dividend. Use this table to compute the amount of dividend each of the 20 girls received. (Refer to page 182 for cost of each share of stock. Use this amount for computing annual dividends.)

	NAME	NUMBER OF SHARES OWNED	AMOUNT OF DIVIDENDS AT 2½%
(*a*)	Alma Bates	15	—
(*b*)	Ann Bohan	8	—
(*c*)	Betty Carr	20	—
(*d*)	Carrie Dunn	17	—
(*e*)	Catherine Embry	2	—
(*f*)	Dorothy Faro	12	—
(*g*)	Eleanor Gates	14	—
(*h*)	Elizabeth Horn	23	—
(*i*)	Ellen O'Neil	10	—
(*j*)	Florence Rocci	21	—
(*k*)	Grace Rose	15	—
(*l*)	Helen Schad	9	—
(*m*)	Jane Stern	14	—
(*n*)	Louise Tare	13	—
(*o*)	Madeline Tell	5	—
(*p*)	Margaret Tovak	33	—
(*q*)	Sally Unaz	29	—
(*r*)	Sarah Vikz	8	—
(*s*)	Susan Wilson	3	—
(*t*)	Virginia Young	12	—
	Totals	—	—

PROBLEM VI

What Is the Cost of Loans Made by Loan Sharks?

The true stories of how loan sharks treat their victims are startling to most persons. A loan shark is an outlaw moneylender. His interest rates are frequently as high as 100% a month. He thrives in places where legal rates for loans are so low that legitimate organizations cannot operate at a profit. Under such conditions, when a person desperately needs money beyond his regular wages, the loan shark is innocently turned to as the only source of easy credit.

If you must borrow, beware of the lender who —

(*a*) asks you to sign papers before the figures are filled in.

(*b*) requires payment of the full principal and interest within a week or two.

(*c*) requires you to buy expensive insurance as a condition of obtaining the loan.

(*d*) for a fee offers to "arrange for" your loan.

(*e*) requires you to pay fees over and above the legal rate authorized by law.

(*f*) says he does not make a loan but purchases your wages.

(*g*) has no office, but says he carries on lending as a side line.

(*h*) does not display a state license in a state which regulates small loans.

(*i*) gives you, as part of your loan, purchase coupons which require you to buy something.

(*j*) dates your note prior to the time when you get the money.

(*k*) requires you to sign more than one note for one loan.

(*l*) requires excessive security, such as a lien on your car or a mortgage on your house, which is worth far more than the loan.

(*m*) refuses to give you either a copy of the papers you sign or receipts for payments.

(*n*) when you pay the debt in full, fails to return to you all the papers you have signed.

(*o*) avoids regulation by requiring you to sign a receipt for more than $300 while lending you considerably less.

Questions to Discuss and Things to Do

1. Do you believe people who are as well educated as yourself become victims of loan sharks?

2. Imagine yourself to be governor, state senator, or attorney-general in a state where loan sharks are known to operate. What would you do to try to eliminate these illegal lenders from your state?

3. If you discovered a person who was a victim of a loan shark, what would you advise him to do to free himself?

4. If a loan shark was found guilty of collecting 240% interest and of requiring his customer to repay his loan all at one time, what punishment do you think would be a suitable one?

5. If you became anxious to know whether or not there are any loan sharks operating in your community, how would you go about satisfying your curiosity?

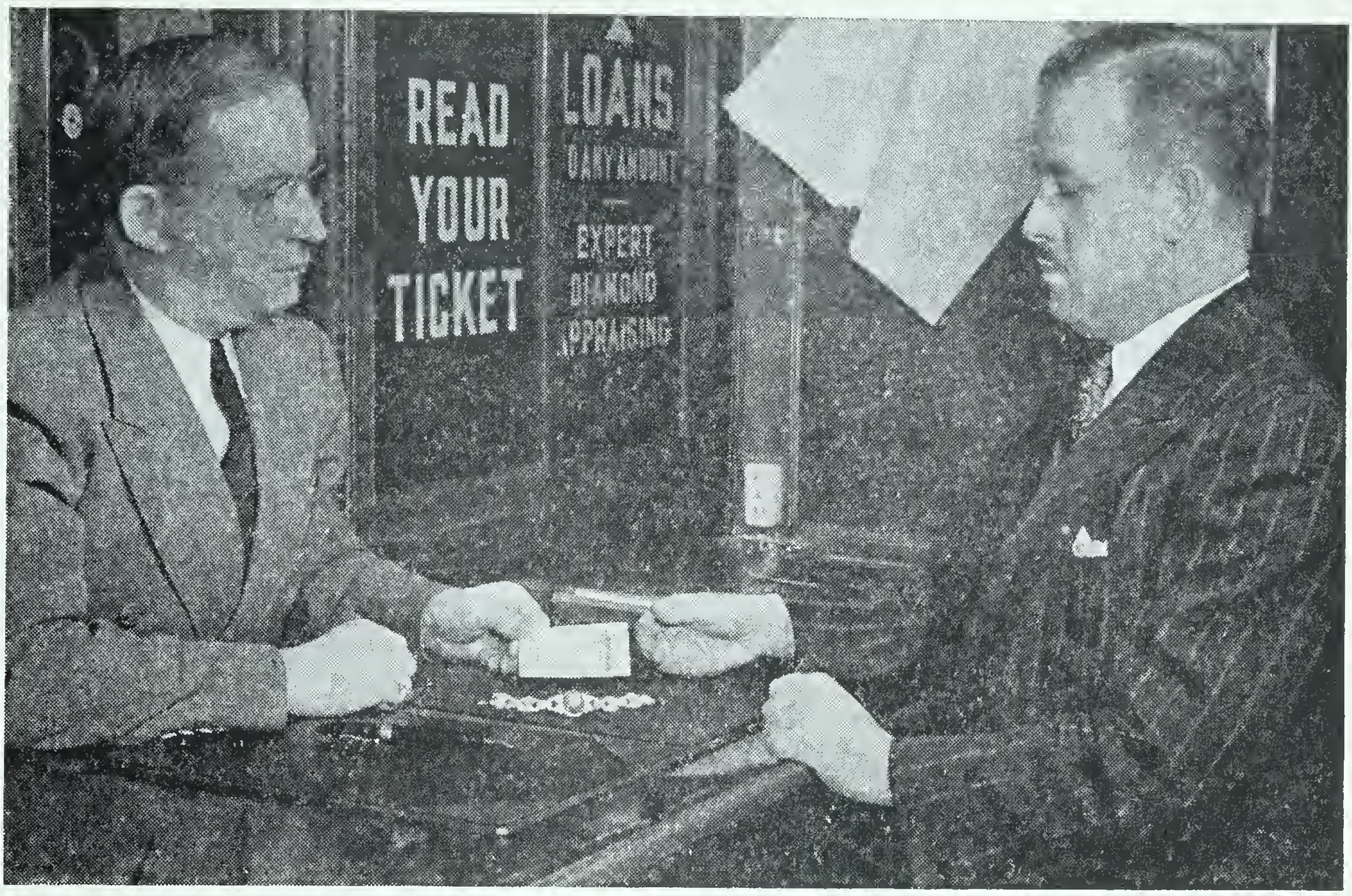
6. On January 15, a workman "sells" $20 of his salary, due on the 30th, for $18 to a loan shark. The interest charges are $2 for half of a month or _?_ for a month, or _?_ for a year. This is the equivalent of an interest rate of _?_% a year on the $18 borrowed.

7. If a loan shark gets 240% interest on a loan of $20, the amount of interest he collects in a year is _?_. If he gets 1040% interest, the amount he collects in 6 months is _?_.

8. At a hearing on a bill to eliminate loan sharks, a victim testified that nine years ago he borrowed $160. All together he paid $1800 in interest and still owed the principal. What rate of interest did he pay?

9. Persons temporarily out of work or on relief are sometimes victims of loan sharks. Here are three typical cases:

Mr. B, a married man with two children, borrowed $25 at an annual interest rate of 220%.
Mrs. H, an elderly widow, borrowed $30 at 320% annual interest.
Mr. S, a single man, borrowed $10 at 1200% annual interest.
What was the yearly amount of interest in each of these cases?



Ewing Galloway

Why do you suppose the words "Read Your Ticket" are so prominently displayed?

Final Test on Unit III

PART I

In each of the following statements one word or phrase is underlined. On a sheet of paper write a column of numbers from 1 to 10. Read each statement. If it is true, write "+" immediately after the corresponding number. If it is false, write the correct word or phrase immediately after the corresponding number.

SAMPLE STATEMENT:

1. Interest at $3\frac{1}{2}\%$ a month equals an annual rate of 36%.

YOUR TABULATION:

1. 42%

1. Consumer credit is the kind which a merchant uses in borrowing money on an order of goods.

2. Approximately double the sum of the principals owed the first and last periods gives the correct principal for computing interest rates on installment purchases.

3. In using the constant ratio formula one assumes that an unchanging part of all payments goes for interest.
4. Small loan companies frequently require that their loans be secured by some sort of collateral.
5. The largest loan which the law usually allows small loan companies to make is \$500.
6. An annual interest rate as high as 42% is legal for small loan companies in several states.
7. According to the Uniform Small Loan Law developed by the Russell Sage Foundation, interest is charged on the unpaid balance of a loan.
8. Installment loans by banks are usually commercial loans.
9. When a loan is made and interest is discounted at 6%, the actual interest rate is lower than 6%.
10. The rate of interest most frequently charged by credit unions is 1% a month.

PART II

For each of the problems do three things: First, after careful reading, guess what rate of interest is being charged. Second, using formula $r = \frac{24\,I}{n(f+l)}$, and third, using formula $r = \frac{2\,mI}{B(n+1)}$, compute the interest rates. Record your guessed rate and computed rates to the nearest whole per cent for each problem.

11. A saxophone which sells for \$120 cash or \$40 down and \$8 a month for a year. (Watch out for the fact that interest exceeds monthly payments.)

12. A \$300 loan with interest charges of \$18, all to be paid off in 6 equal monthly installments.

13. A credit union loan of \$50 to be repaid in 10 monthly installments, with a total interest charge of \$2.06.

Inventory Test 9: Decimal Fractions

Remember, you are allowed only one mistake on an inventory test. Follow the directions below. *Time, 4 minutes.*

Copy the following decimals, arranging them in the order of their size, with the largest first and the smallest last:

1. .6, .07, .42
2. .2, .07, .564

Supply the missing fractions:

3. $\$.33\frac{1}{3}$ = _?_ of \$1
4. \$.80 = _?_ of \$1

Supply the missing decimals:

5. $\frac{1}{4}$ of \$1 = \$_?_
6. $\frac{2}{5}$ of \$1 = \$_?_

Add:

7. 200.4 + 36.0 + 36.9
8. 3.4+.7+0.3+2.6+7.8

Subtract:

9. 9.32 − 4.65
10. 26.000 − .026

The answers are on page 423. If you failed on Inventory Test 9, you should take Practice Tests 9 A to 9 G on pages 414 and 417.

Inventory Test 10: Multiplication and Division of Decimals

Now we are ready to try a different type of example involving decimals. The answers in the following examples have not been "pointed off." Copy each answer on another sheet of paper and put the decimal point where it belongs. Put in zeros where necessary. *Time, 4 minutes.*

1. 200 × .03 = 600
2. $\begin{array}{r} 234 \\ .148\overline{)34.632} \end{array}$
3. 30 × .10 = 300
4. $\begin{array}{r} 234 \\ 14.8\overline{)34.632} \end{array}$
5. .30 × 7.0 = 2100
6. 2.7 × 0.3 = 81
7. $\begin{array}{r} 2\ 34 \\ 14.8\overline{)346.32} \end{array}$
8. $\begin{array}{r} 2\ 34 \\ .148\overline{)346.32} \end{array}$

(Continued on next page)

Inventory Test 10 (Cont'd)

9. $3.0 \times .7 = 210$

10. $\begin{array}{r} 2\ 34 \\ 148\overline{)346.32} \end{array}$

11. $\begin{array}{r} 2\ 34 \\ 1.48\overline{)346.32} \end{array}$

12. $0.4 \times 8.0 = 320$

13. $1865 \times .4 = 7460$

14. $\begin{array}{r} 234 \\ 1.48\overline{)34.632} \end{array}$

15. $6.25 \times .7 = 4375$

16. $\begin{array}{r} 234 \\ .148\overline{).34632} \end{array}$

17. $3.0 \times .1 = 30$

18. $\begin{array}{r} 234 \\ 148\overline{)34.632} \end{array}$

19. $\begin{array}{r} 234 \\ 1.48\overline{)3.4632} \end{array}$

20. $3.0 \times 3.0 = 900$

21. $2.58 \times .3 = 774$

22. $\begin{array}{r} 234 \\ .0148\overline{).34632} \end{array}$

23. $39.27 \times .05 = 19635$

24. $\begin{array}{r} 234 \\ 148\overline{).34632} \end{array}$

The answers are on page 424. If you failed on Inventory Test 10, you should take Practice Tests 10 A to 10 D on pages 417 and 418.

Things I should know how to do
At home
make a budget
keep expense account
check costs of utilities
check bank statements
On the job
make out sales slips
make change
make out bills
compute profit and loss
compute commissions

Black Star

UNIT IV

At Home and on the Job

Mathematics in the Family Circle

Does the home in which intelligent people live, work, and play together have need for mathematics? In such a home the members will scarcely be aware that they are using mathematics, and yet it will enter into almost everything they do.

Let's look in on the Kovacs shortly before their evening meal. Clara, the oldest of four children, is watching a TV show. She is trying to decide whether she should practice on the piano for a half hour before supper and a half hour after supper or wait until after supper and then practice a full hour. She is supposed to meet Mary King at the Bijou at 8:30, but she'd like to postpone the piano practice as long as possible. "Let's see, it'll take nearly 15 minutes to get to the Bijou, supper won't be ready until 6:30, and I can eat in 10 minutes. But is it my turn to do the dishes?" Clara has to solve a little problem in mental arithmetic. Alice, a younger sister, calls to Mother to help her with a little domestic science problem. She is making a cover for the lamp shade in her room and doesn't know how to determine the length of material she needs. But Mother solves the problem in arithmetic by telling Alice to measure the distance across the middle of the frame and multiply that distance by 3.14. Then Mother hurries back to the kitchen to adjust a recipe for chocolate pudding so as to provide an extra serving for Jim, who has been found underweight and who has been advised to try to gain five pounds.

But Jim is interested in a birdhouse that he wants to hang in the back yard. He has been able to get some squared paper which is ruled to inches and tenths of an inch. With this paper he can make the nine-inch height by counting up nine squares and the seven-inch width by counting across seven squares. He had learned how to do this while making graphs in school. Son Bill has seen a bike in the show window marked $45, with a 15% discount during September and October, and he is figuring how much he will need to save each month in order to buy it before the end of October.

Dad is taking a hurried glance at the evening paper. His attention is caught by something on page 3, and he interrupts to say, "Let me read you this item: 'One of man's greatest inventions was the symbol for zero.' For my part, I could get along without the invention of zero in my budget."

Harold M. Lambert from Frederic Lewis

Alice needs mathematics to make an apple turnover, and Bill wants to see if there are any discounts on bicycles listed in the evening paper.

But Alice says, "Oh, no, Dad. My mathematics teacher tells me that it was really a great day when someone finally invented zero; for it led to standards of measurement, weight, time, and money."

At this instant Mother's call from the dining room puts a temporary halt to all considerations other than eating.

To be sure, the needs of mathematics both in the home and in everyday relations with business practice are simple. These simple problems occur again and again throughout life, yet many persons never seem to be able to solve them. This unit is constructed on the assumption that it is better to teach you a few common things well than to give you a smattering about a great many things which you may seldom, if ever, encounter. In preceding units we have covered some of the mathematics needed in the home and in business. But there are a few more with which you should be familiar. For example: What is a practical budget for personal and family use? What business forms is the young worker expected to know? What is a discount? What is a payroll? These are some of the practical questions that will be answered in this unit.

PROBLEM I

How May a Family Manage a Workable Budget?

Perhaps you are surprised that this problem is not stated as follows: *How does a budget help to save money?* It is reasonable to assume that for most persons a budget, if faithfully kept, would tend to save money, for a budget is an accurate record showing what things are bought and for how much. Moreover, anyone can readily find excellent forms of budgets for different purses. Unfortunately, the budget problem is not simply a matter of filling out a form made by someone else. First, it is necessary to devise a satisfactory budget, and second, it is necessary to avoid becoming discouraged when keeping a budget. Many persons take up the budget idea with great enthusiasm but for one reason or another soon become discouraged and give it up. Perhaps the main reason is that instead of managing the budget, they allow the budget to manage them.

You might find it worth while to get a bit of evidence on each of the following questions: (1) Of the 10 families that you know best, how many are now keeping a budget? (2) How many of these 10 families have at some time kept a budget? (3) How many believe that keeping a budget is, in general, a very good idea?

Making up a budget, keeping it flexible for changing conditions, and making it work for you can be fun — if you try to win just as you do in a game.

The Gray family make out a budget.

Now let's see how the Gray family "play the game" of budgeting. In the Gray family there are mother, father, Helen, Bill, and Sam. The budget game which they play is typical of the way it may be played in the average American family. Watching the Grays play the game of budgeting may give you some ideas for playing it yourself.

Step 1 for the Grays is to list all the things for which each member of the family expects to spend money during the next year. The list includes both necessary and unnecessary items. This means a pretty extensive list. Each item is very definite and specific but is placed in a group under one of these headings: food, shelter, clothing, housekeeping expenses, transportation, health-education-recreation, gifts, personal, and savings. The probable cost of each item is estimated as accurately as possible and then entered in the list.

Step 2 for the Grays is to estimate how much money they will actually have available in a year. They list all sources of income; this includes earnings of each member of the family, as well as any interest that they are reasonably certain they will receive from investments.

Step 3 for the Grays is to get a score of zero in their game of budgeting. In the first step they purposely listed everything they wanted even though they knew they wouldn't be able to afford some of the items. Now they must do one, two, or all three of the following things: they must decide on ways of increasing the family income, of eliminating expenditures for nonessentials, and of reducing the expenditures for essentials. The ways by which income may be increased are limited; so most of the adjustment must come in the expenditures. And the adjustment must continue until the amount of income equals the amount of expense. Then the game is won.

Step 4 for the Grays is a special play in the game of budgeting — a play which they have found effective after several years of experience. It is particularly helpful in getting good coöperation. When the family budget is completed, each person in the family arranges his own personal budget. He is allowed his share of the family income with which he must take care of his expenses.

Step 5 for the Grays is to keep accurate accounts of expenditures made during the year. The expense accounts guide them in keeping within the budget. At the end of the year they use these accounts as a basis for planning and adjusting the budget for the next annual budget game.

Now that we know the steps in this budget game that the Grays play, let's play it along with them.

Step 1. Estimate expenses.[1]

The first step is to estimate the expense for each important item.

1. Mrs. Gray estimates that the food for the family will cost about $60 each month, or ? for the year.

2. The Grays are paying for their house. So for the cost of shelter Mr. Gray estimates $450 for payments on principal and interest, $90 for taxes, $20 for insurance, $50 for repairs, and $100 for depreciation. This amounts to ? for the year, or ? per month. (Payments on principal are largely a savings expense. See Ex. 11.)

3. Each member of the family estimates the cost of clothing for himself. Helen's estimate is $85, Bill's is $88, Sam's is $55, Mrs. Gray's is $90, and Mr. Gray's is $85. These estimates total ? for the year, or ? per month.

4. Mrs. Gray estimates the housekeeping expenses to be $5.50 per month for gas, $5.00 per month for electricity, $8.50 per month for fuel, $4.75 per month for telephone, and $7.50 per month for supplies, etc. It will cost $100 per year to repair and replace household equipment. Her estimate of housekeeping expenses for the year is ?.

5. Mr. Gray estimates that it costs about 5 cents per mile to drive his car and that he will drive it about 9000 miles next year. What will this expense amount to?

6. The Grays carry a family health insurance policy on which the premium each month is $8. Mrs. Gray says it will take about $50 for the children during the year at school for books and incidentals. She thinks the family should be able to afford $150 during the year for recreation. These three items total ? for the year.

7. Each member of the Gray family contributes regularly to the church. Together their contributions amount to $1.50 each Sunday. Their Christmas and birthday presents amount to about $50. Their contributions to organizations like the Red Cross and the Community Fund amount to about $30. These items amount to ? for the year.

---

[1] To the Teacher. Income taxes are not included in estimated expenses. They are usually deducted from the pay check; are not optional expenses; cannot be regulated by the individual. Therefore, only the income and the expenses which the family may regulate are included in the budget.

8. The personal expenditures for the Gray family are estimated to be two 85-cent haircuts for Mr. Gray and each of the boys each month, one $10 permanent for Mrs. Gray and two for Helen during the year, 6 shampoos and finger waves for Helen during the year at $1.50 each. Mr. Gray estimates that his smoking costs about 75 cents each week. For toilet articles and other incidental personal expenditures during the year $38 is considered enough. These items cost _?_ per year.

9. Last year the income for the family was $3275 after taxes. They saved 10% of this income, which is $_?_. Mr. Gray thinks they should save as much money next year.

10. Find the total of these nine groups of expenses for the next year.

11. The Grays think that, since they are paying for their house, they can count about $350 a year of their shelter expense as saving (investment). Do you think this is sound reasoning?

12. Mr. Gray says that each child should share in the savings, since they helped to earn the income. Accordingly, 10% of the savings (not including payments on the house) or _?_ was invested for each child. Do you think this is a fair decision or should it have been made proportionate to the amount earned?

Step 2. Estimate income.

The second step is to estimate every possible source of income.

1. Mr. Gray earns $57.70 per week in a factory, after taxes are deducted. He thinks it is safe to estimate that his earnings will continue the same for next year. He, then, estimates that his annual income for next year will be _?_.

2. Mr. Gray inherited a farm from his parents. He sold it for $2500 last year and invested the money in bonds yielding 3% interest. He, then, estimates that his income from these bonds for next year will be _?_.

3. Helen has a job working in the ten-cent store Saturday afternoons and during school holidays. She gets 75 cents per hour for 2 hours each Saturday and the same rate for 8 hours each full day she works. Last year she worked 12 full days and all but 4 Saturdays. She thinks she can do as well next year and, therefore, will contribute _?_ to the family income.

4. Bill has a paper route from which he has never earned more than $7.80 per week nor less than $6.16 per week. He figures that the average of these two amounts is a safe estimate of his weekly earnings for next year and that he will add _?_ to the family income.

5. Sam does odd jobs for the neighbors, like mowing the grass, raking leaves, and running errands. From his last year's account he finds that his total earnings were $37.04. He thinks it is safe to estimate that he will make 10% more next year, or _?_.

6. How much do the Grays estimate their total income from these five sources will be for next year?

Step 3. Balance expenses with income.

1. In any workable budget, the expenses (including savings) equal the income. Mr. Gray announced that, in round numbers, the family's estimate of expenses was $3717 and of income $3623. This means that an adjustment of _?_ must be made to balance the budget.

2. The Grays live just beyond the city limits and have a large space for a back yard. Mr. Gray and the boys decide they will decrease the family expenses by using a part of this space as a vegetable garden. Mrs. Gray says that her $60 estimate for food is a little high and with the fresh vegetables they can raise and the canning she can do she should be able to save an average of about $4 per month on food. Mr. Gray decides that his smoking is a costly and useless habit and that he will stop. No smoking on his part will reduce the estimate of expenses by approximately _?_ for the year. Roughly these two items amount to _?_ for the year.

"Our estimated expenses exceed our estimated income by only $7, and that is close enough for our budget," said Mrs. Gray.

Step 4. Set up a personal budget for each member of the family.

In the preceding three steps of the budget game, the Grays have rearranged their estimates of expenditures and income until they both equal about $3630. Next, each of the five members of the family is given responsibility for managing a part of the budget. Mrs. Gray must manage the parts of the budget having to do with food and housekeeping expenses. Mr. Gray must manage the parts dealing with shelter and transportation. Each person must manage the parts of the sections of the budget dealing with clothing, health-recreation-education, gifts, personal expenditures, and savings that affect him.

1. Mrs. Gray's budget looks like the following:

Food $56 per month	$672.00
Clothing	90.00
Housekeeping expenses $40 per month	480.00
Recreation	20.00
Gifts and contributions	60.00
Personal expenditures	12.00
Savings	95.00
Total	

How much of the total amount in the family budget is she responsible for during the year? What should be her total monthly allowance?

2. Prepare a budget like Mrs. Gray's for Mr. Gray. Remember, Mr. Gray is responsible for the family shelter; his own clothing; family transportation; his personal recreation, gifts and contributions, expenses, and savings. (Refer back to Steps 1, 2, and 3 of the budget if necessary, and estimate where exact information is not available.) Determine Mr. Gray's monthly share of the family income.

3. Prepare separate budgets for Helen, Bill, and Sam and determine the monthly allowance for each. Be sure that your total for all the budgets checks with the total estimate for the family budget.

MRS. GRAY'S BUDGET AND SUMMARY EXPENSE ACCOUNT

MONTH	WEEK	FOOD	CLOTHING	HOUSEKEEPING	RECREATION	GIFTS	PERSONAL	SAVINGS	TOTAL CUMULATIVE BALANCE
March bal.		9.17	1.27	41.78	8.71	7.21	1.09	0.00	69.23
April budget		56.00	7.50	40.00	1.66	5.00	1.00	7.92	119.08
Tot. for April		65.17	8.77	81.78	10.37	12.21	2.09	7.92	188.31
APRIL	1	8.97		2.13		.50			
	2	15.28		1.56		.50			
	3	13.05	6.50	3.45		.50			
	4	14.90				.50			
	5	7.63						7.92	
Total spent		59.83	6.50	7.14	0.00	2.00	0.00	7.92	83.39
April bal.		5.34	2.27	74.64	10.37	10.21	2.09	0.00	104.92
May budget		56.00	7.50	40.00	1.66	5.00	1.00	7.92	119.08
Tot. for May		61.34	9.77	114.64	12.03	15.21	3.09	7.92	224.00
MAY	1	6.50				.50			
	2	12.97		4.19		.50	1.50		
	3	15.02	3.98			.50			
	4	14.00				5.42			
	5	7.25		91.00		.50		7.92	
Tot. spent		55.74	3.98	95.19	0.00	7.42	1.50	7.92	171.75
May bal.		5.60	5.79	19.45	12.03	7.79	1.59	0.00	52.25
June budget		56.00	7.50	40.00	1.66	5.00	1.00	7.92	119.08
Tot. for June		61.60	13.29	59.45	13.69	12.79	2.59	7.92	171.33
JUNE	1	6.30							
	2	13.50	12.98	2.15		.50			
	3	12.80		.98	13.50	.50	1.00		
	4	15.10				.50			
	5	5.80		8.70		.50		7.92	
Total spent		?	?	?	?	?	?	?	?
June bal.		?	?	?	?	?	?	?	?
July budget		56.00	7.50	40.00	1.66	5.00	1.00	7.92	119.08
Tot. for July		?	?	?	?	?	?	?	?

Step 5. Keep accurate expense accounts.

Mrs. Gray has formed the habit of listing her weekly expenditures on a memorandum pad which she keeps in her kitchen. At the end of each week she finds the sum of each group of items and enters the totals in a record book. A page from her record book is shown on the opposite page. It is for the months of April, May, and June.

The Grays fill their coalbin in May because coal is cheaper then than at any other time during the year. This accounts for the $91.00 spent during the last week in May. There is an accumulated balance to meet it, however. Likewise, Mrs. Gray takes a trip during the third week in June and uses practically all the accumulated balance for recreation. Does this indicate that her budget was well planned?

1. Find the correct entries in the rows at the end of the table beginning "Total spent," "June balance," and "Total for July."

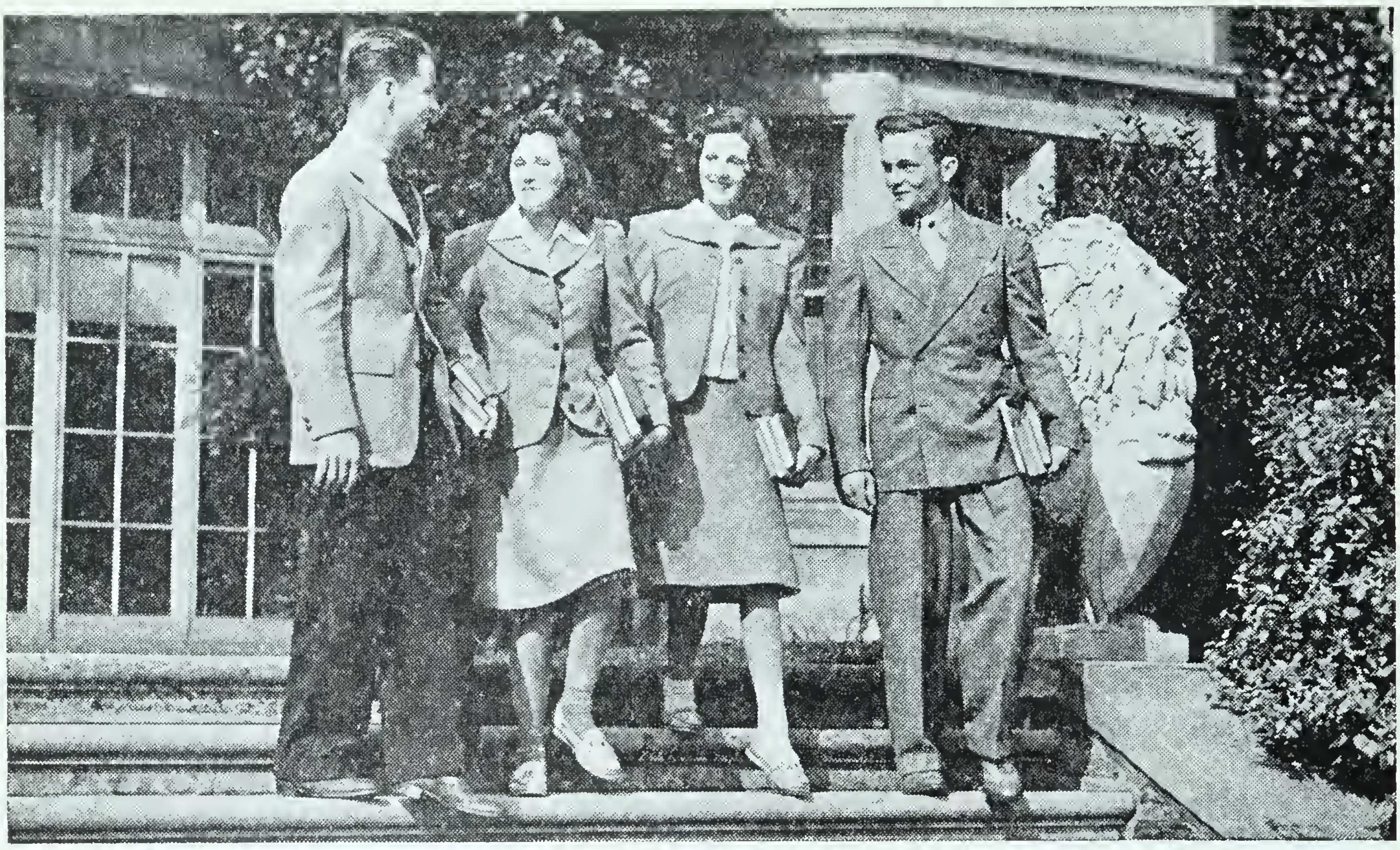
2. Mr. Gray keeps an individual account similar to the one kept by Mrs. Gray. Of course, the item headings differ somewhat because of the responsibilities for different parts of the budget. Prepare a summary expense account for Mr. Gray for the month of August, using the following itemized amounts:

July balance: shelter, $61.00; clothing, $3.70; transportation, $15.30; health and recreation, $.75; gifts and contributions, $.38; personal expense, $.15; savings, 0; total cumulative balance, $81.28.

Budget allowances for August: shelter, $59.17; clothing, $7.08; transportation, $37.50; health and recreation, $11.00; gifts and contributions, $4.40; personal, $1.80; savings, $12.00.

Expenses, for first week: gifts, $.50; transportation, $11.07. *For second week:* shelter, $25.00; transportation, $8.42; health and recreation, $.50; gifts, $.60; personal, $.85. *For third week:* clothing, $3.25; transportation, $9.16; gifts, $.50. *For fourth week:* transportation, $9.42; health and recreation, $3.25; gifts, $.50; personal, $.85. *For fifth week:* shelter, $51.25; transportation, $10.13; health and recreation, $5.15; gifts, $2.00; savings, $12.00.

***3.** Prepare separate summary expense accounts for Helen, Bill, and Sam. (Perhaps some student will be willing to mimeograph a form that can be used for each of these accounts.)



Harold M. Lambert from Frederic Lewis

How much does it cost your family to keep you in school?

You can reduce the amount that represents your own cost on the family budget.

What do you cost [1] your family each year? How much is spent for your food? your clothes? your shelter? your recreation? medical and dental services? reading materials? spending money? You will probably be surprised when you find the answers to these questions.

The financial relationship between you and your parents is important. In many ways you can help your family make its income buy as much as possible. But you will first need to get some facts about your cost to the family. We suggest that each student turn in to a committee an unsigned page on which he has written his estimate of the amount that he costs his family each year. Obviously it will be helpful to discuss this problem with your family. Your parents will probably be glad to help you when you assure them that not even your teacher need know which figures you report.

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[1] To the Teacher. No doubt most students can do no more than make rough estimates in answering these questions. Nevertheless, the problem of this section is a practical one that each student can attack in realistic fashion. It may be helpful to suggest that in general a student's record of costs should be considered confidential by the teacher.

It is suggested that you read the following questions and by class vote select one or more that you will discuss at a fixed time in some future class period. And between the present time and the time of the discussion, you will want to bring brief notes to class as reminders of points that you plan to contribute, and to begin preparing yourself for the discussion.

Questions to Discuss and Things to Do

1. What do you think is the average cost of rearing a child in your community from birth to age 18?

2. For what tasks done for the family would you like to be paid in cash? Why do you think you should be paid?

3. Should you be paid a cash premium for getting high marks in school? Give logical reasons for your answer.

4. Have you ever made an inventory of all your personal belongings? Determine the present money value of all your possessions.

5. What is the average allowance per week of the students in your class? (The facts for this study should consist of unsigned statements.)

6. Make a comparison of the standard of living of American laborers or farmers with that of similar workers found in several other countries in the world.

7. How much could you consume if you had an income of a million dollars per year?

8. Why do so many families live beyond their income?

9. What does "keeping up with the Joneses" do to the family budget?

10. How much do you think you would have to earn in later life to buy the things that you will *need* to *satisfy* your *wants?*

PROBLEM II

What Are the Costs of Heat, Electricity, Gas, and Water in a Family Budget?

The cost of heating a house is an important item in the budgets of many families. Similarly, the cost of service for utilities such as electricity, gas, and water may constitute a fairly large item if you own your home or if such services are not included in the monthly rental charge. It may be worth while for each student, with some member of his family, to work through the items suggested under this topic as an out-of-school study, using local prices.

Consider the costs of heating.

Evelyn's family is going to build a new house. Her father and mother have allowed her to help in the planning ever since they decided to build. She has been particularly helpful in selecting the furnishings.

One night Mr. Allen said, "We must begin to think about what kind of furnace we are going to use in our new home."

Mrs. Allen asked, "What are the prices of the different kinds?"

"The cost of the furnace is not the most important thing to consider," Mr. Allen quickly replied. "It is the cost of the fuel, which continues year after year, that we must think about first."

"Do you mean, Dad, that we should decide whether to use coal, oil, or gas?" asked Evelyn.

"Exactly," Mr. Allen answered.

"Oil doesn't get the house dirty," Mrs. Allen suggested.

"Gas ought to keep the house as clean as oil, but the thing we need to consider first is which is cheapest," added Mr. Allen. "Get a piece of paper and a pencil, Evelyn, and let's do some figuring.

"First of all we must compute the cost of the heat actually produced by the fuel. The British Thermal Unit (B.T.U.) is the unit of heat commonly used. *One B.T.U. is the amount of heat needed to raise the temperature of 1 pound of water 1 degree Fahrenheit.* We shall use this unit in our problems." [1]

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[1] To the Teacher. The estimates on production of B.T.U.'s used in these problems are taken from data supplied by the U. S. Bureau of Mines.

Timken Silent Automatic Division

Mr. Allen is "fed up" with cleaning the furnace room. Meanwhile Mrs. Allen insists that a change in fuel would reduce her launderer's and cleaner's bills. Can you see why?

Questions to Discuss and Problems to Solve

1. One pound of the coal we can get from the local dealer produces about 13,500 B.T.U. So there are approximately ? million B.T.U. in a ton of 2000 pounds. If coal sells for $16 per ton, the cost per million B.T.U. is ?.

2. One gallon of fuel oil produces about 138,000 B.T.U. So ? gallons (to nearest tenth) of fuel oil are needed to produce one million B.T.U. At 14 cents per gallon for fuel oil, the cost of one million B.T.U. is ?.

3. One cubic foot of natural gas produces 1000 B.T.U. ? cubic feet are needed to produce one million B.T.U. At 80 cents per thousand cubic feet, this much gas will cost ?.

4. About 40% of the heat from coal is lost up the chimney or in other ways. Consequently, only ? B.T.U. of the 27,000,000 B.T.U. produced by 1 ton of coal is useful heat. At $16 per ton for coal, the cost per million useful B.T.U. is ?.

5. If, by very careful firing, the heat lost from coal could be reduced to 30%, the useful heat produced by each ton of coal would be ? B.T.U. At $16 per ton, this useful heat would cost ? per million B.T.U.

6. Approximately 75% of the heat produced by fuel oil is considered useful heat. Therefore, of the 138,000 B.T.U. produced by 1 gallon of fuel oil, ? B.T.U. is useful heat; and ? gallons (to the nearest tenth) of fuel oil are needed to produce 1 million useful B.T.U. At 14 cents per gallon, each million useful B.T.U. costs ?.

7. Approximately 80% of the heat produced by natural gas is considered useful heat. Hence, of the 1000 B.T.U. produced by 1 cubic foot of gas, ? B.T.U. is useful heat; and ? cubic feet of natural gas are needed to produce 1 million useful B.T.U. At 80¢ per thousand cubic feet, each million useful B.T.U. costs ?.

8. Mr. Allen told Evelyn that another way of comparing the costs of these fuels would be to answer this question: "How much would it cost to buy as much useful heat in oil or gas as 1 ton of coal will produce?" He suggested that she put her solution in a table like this:

B.T.U. of useful heat produced by 1 ton of coal 60% of 27,000,000	?
Cost at $16 per ton	$16.00
Gallons of 75% useful fuel oil producing 138,000 B.T.U. per gallon needed to produce as much useful heat as 1 ton of coal (nearest whole gallon)	?
Cost at 14¢ per gallon	?
Cubic feet of 80% useful natural gas producing 1000 B.T.U. per cubic foot needed to produce as much useful heat as 1 ton of coal	?
Cost at 80¢ per 1000 cubic feet	?

Which fuel did Evelyn find to be the cheapest? Do you think her conclusion would hold for the prices in your community? What are some reasons for using the more expensive fuels?

You can figure the cost of electricity.

The Allisons have many electric appliances in their home. For the last two months the electricity bill has been so large that Mrs. Allison thinks she will have to cut down on the use of some of the appliances. If she knew which ones cost the most to use, she could save by using those appliances less often.

Which electric appliances[1] of the home do you think cost most to operate? Which use the most current per hour while they are being operated? Which use the least current per hour? To answer these questions, Mrs. Allison needs to know how electricity is measured and what rates the electric company charges.

Questions to Discuss and Things to Do

1. Mrs. Allison looked at her last electricity bill and found that the unit of measure used was *kwh*. Sally, who had just been studying general science, told her that *kw stands for one thousand watts or one kilowatt; and kwh stands for kilowatt-hour, which means one thousand watts of electricity used for one hour.* She said that 3000 watts = ___?___ kilowatts; 2673 watts = ___?___ kw; 2 kw = ___?___ watts; and 2.5 kw = ___?___ watts. She explained to her mother also that 2 kwh = 2000 watts for 1 hour or 1000 watts for 2 hours; 4 kwh = 1000 watts for ___?___ hours; while 4.3 kwh = 1000 watts for ___?___ hours.

2. According to the bill, the Allisons used 140 kwh of current, for which they were billed $4.85. On the back of the bill, Mrs. Allison found this rate schedule:

First 50 kwh per month 4¢ per kwh
Next 50 kwh per month $3\frac{1}{2}$¢ per kwh
Next 100 kwh per month $2\frac{3}{4}$¢ per kwh
All over 200 kwh per month $1\frac{1}{2}$¢ per kwh
Minimum charge per month 50¢

She computed the amount due in the following manner:

50 kwh @ $.04 = ___?___
50 kwh @ $.035 = ___?___
40 kwh @ $.0275 = ___?___
Total ___?___

---

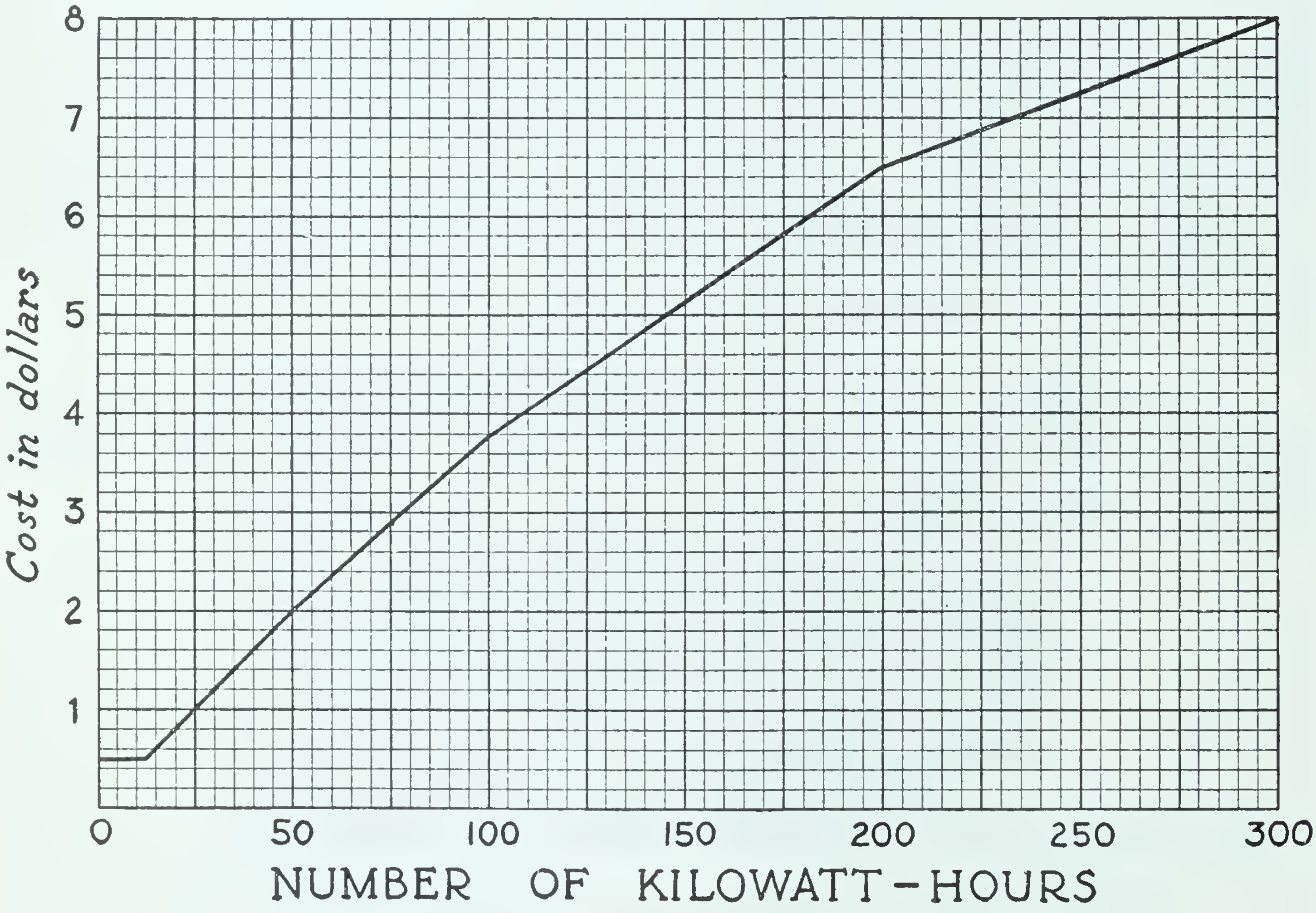
[1] To the Teacher. Some classes have found it very interesting to find the average number of electric appliances in the homes represented by the class. It is suggested that each student turn in an unsigned slip on which he has listed the different appliances in his home.

3. Mrs. Allison decided to compute the costs for several different amounts of current so that she could tell roughly how much her electricity bill should be. Here are the amounts she used:

15 kwh will cost ?
25 kwh will cost ?
50 kwh will cost ?
75 kwh will cost $2.00 + ? = ?
100 kwh will cost $2.00 + ? = ?
150 kwh will cost $3.75 + ? = ?
200 kwh will cost $3.75 + ? = ?
250 kwh will cost $6.50 + ? = ?
300 kwh will cost $6.50 + ? = ?

4. When Mr. Allison saw the figures, he suggested that a line graph would show more clearly the approximate costs for different amounts. Here is the line graph he made:

Graph of Cost of Electricity



From the graph determine the approximate cost for 125 kwh; 175 kwh; 220 kwh; 280 kwh. Can you explain the meaning of the short horizontal line at the left-hand edge of the graph?

5. In order to compare costs of operating her various appliances, Mrs. Allison started with her 300-watt reading lamp. She estimated that this burns 3 hours daily or 90 hours each month. In the same way she computed the number of kwh used by each of her other appliances in a summer month. Here are her tabulations:

1	300-watt light bulb, 3 hours daily	27 kwh
4	40-watt light bulbs, $2\frac{1}{2}$ hours daily	? kwh
1	TV set, 150 watts for $3\frac{1}{2}$ hr. daily	? kwh
1	refrigerator using 1.6 kwh daily	? kwh
1	750-watt sweeper, 3 hr. weekly	? kwh
1	350-watt washing machine, 3 hr. weekly	? kwh
1	1000-watt hand iron, 5 hr. weekly	? kwh
1	660-watt toaster, 15 min. daily	? kwh
1	300-watt food mixer, 20 min. daily	? kwh
1	50-watt fan, 3 hr. daily	? kwh
	Total	? kwh
	Cost	?

Find the total kwh (nearest whole number) used and the cost. Use either the rate table given in Ex. 2 or the graph in Ex. 4.

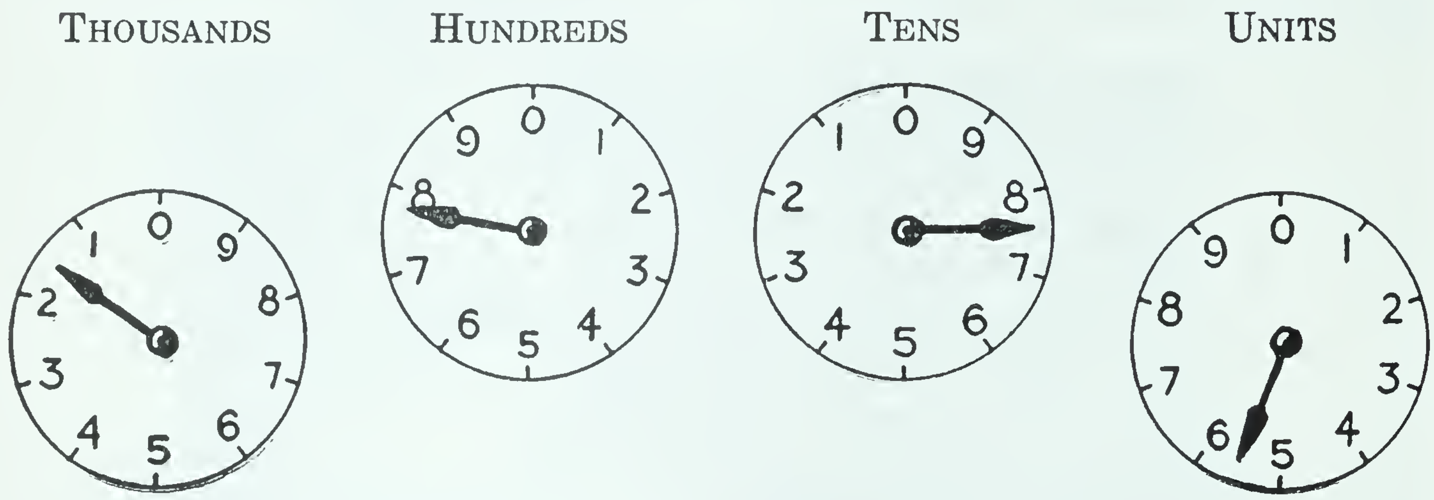
6. What appliances are likely to be expensive to operate? What ones are quite low in cost of operation? Can some of the expensive ones be used less by careful planning?

Learn to read the meters in your home.

In every home that is served by gas, electricity, and water, there are meters which measure and register the quantities consumed. If your home has them, do you know where they are located? Periodically employees of the companies or organizations (called "public utilities") that own these public services come to the house and read the meters. The bills which your parents get for gas, water, and electricity are based on these readings. And, in general, the readings and the bills are correct. But everyone makes a mistake occasionally. It is therefore advisable to know how to read these meters and to form the habit of reading each meter about the same time that the owner has it read. If you keep a record of your readings, you can easily check the bills when they arrive. How many of the families represented by students in your class make regular checks of meter readings?

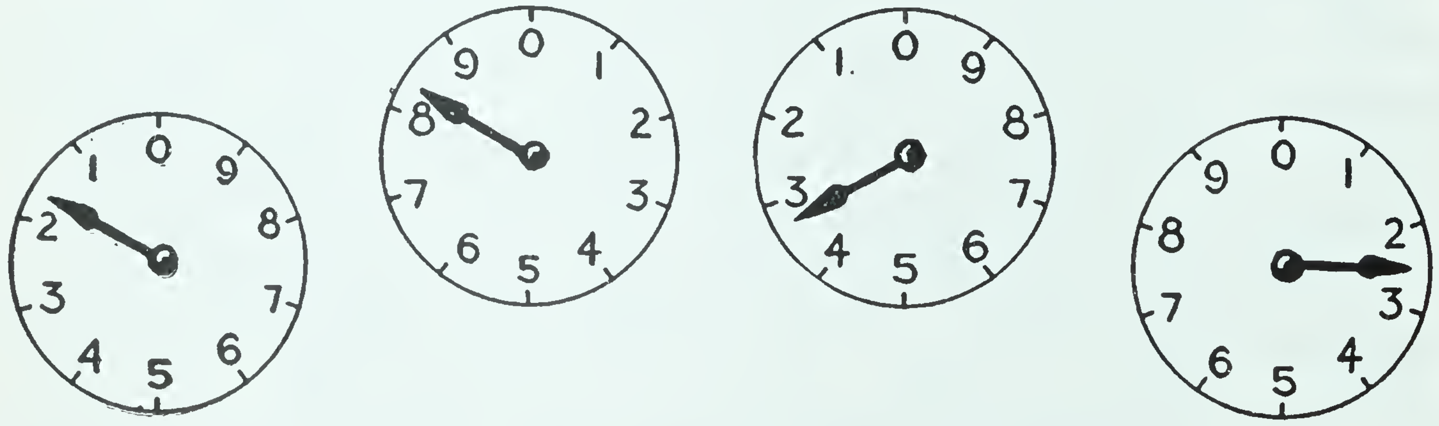
Reading electric meters

The electric meter usually has four dials.[1] They register the number of kilowatt-hours used. Here is the way the dials look:



READING DECEMBER 1

These dials read 1775 kilowatt-hours. The reading was made December 1. Since meters are not turned back to zero at the time of installation, any *one* reading may be taken as a first reading. Where the pointer is between numbers, the next lower number is always read. To determine the amount of electricity used during the month of December, it is necessary to read the dials again on the first of January. Here are the positions of the hands on the dials on January 1. The reading is 1832.



READING JANUARY 1

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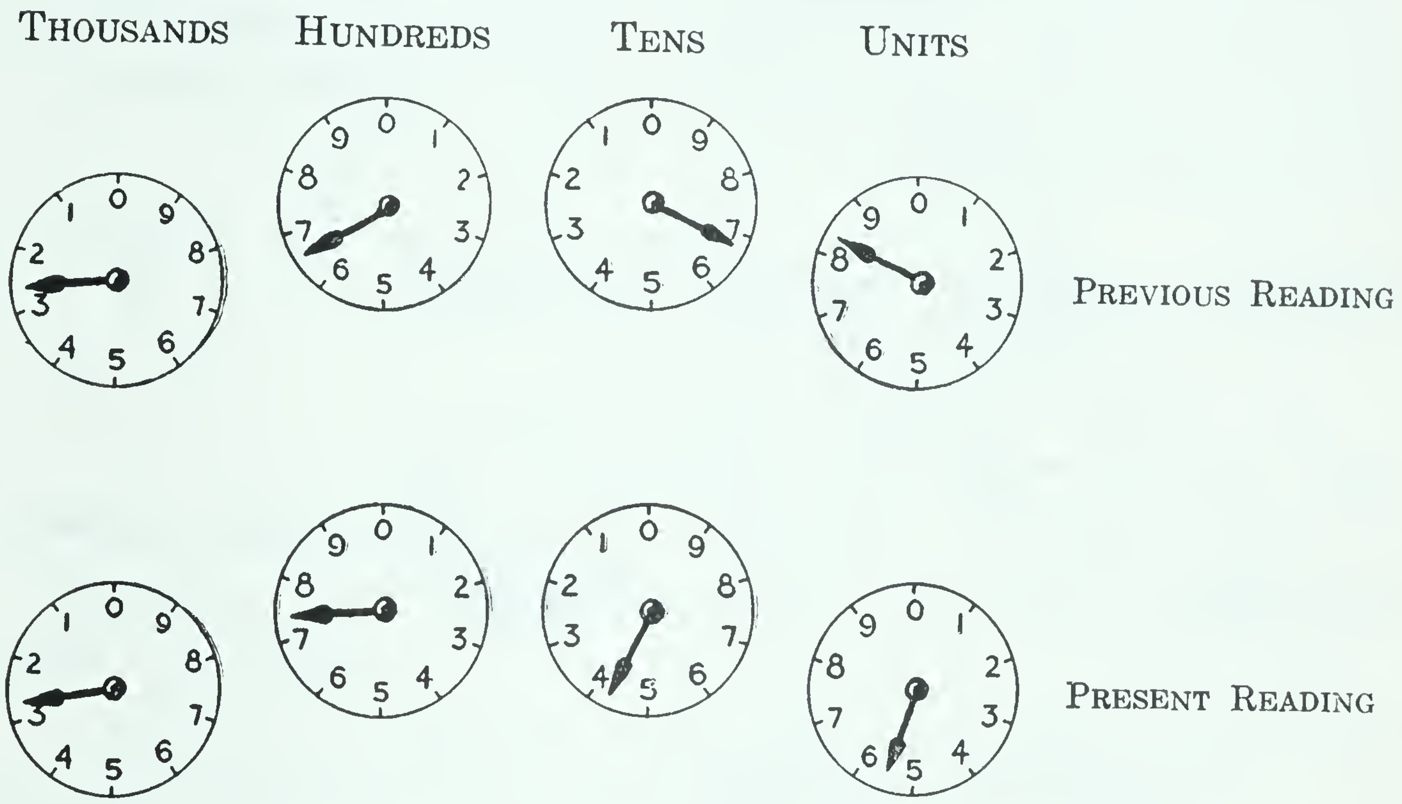
[1] TO THE TEACHER. This section is much more meaningful and interesting when taught with large working models. Thus, one student may set the dials while his classmates record their readings. Readings can readily be checked. Perhaps some inventive students will provide your classroom with this useful laboratory equipment.

These readings show that the number of kilowatt-hours used during the month of December was

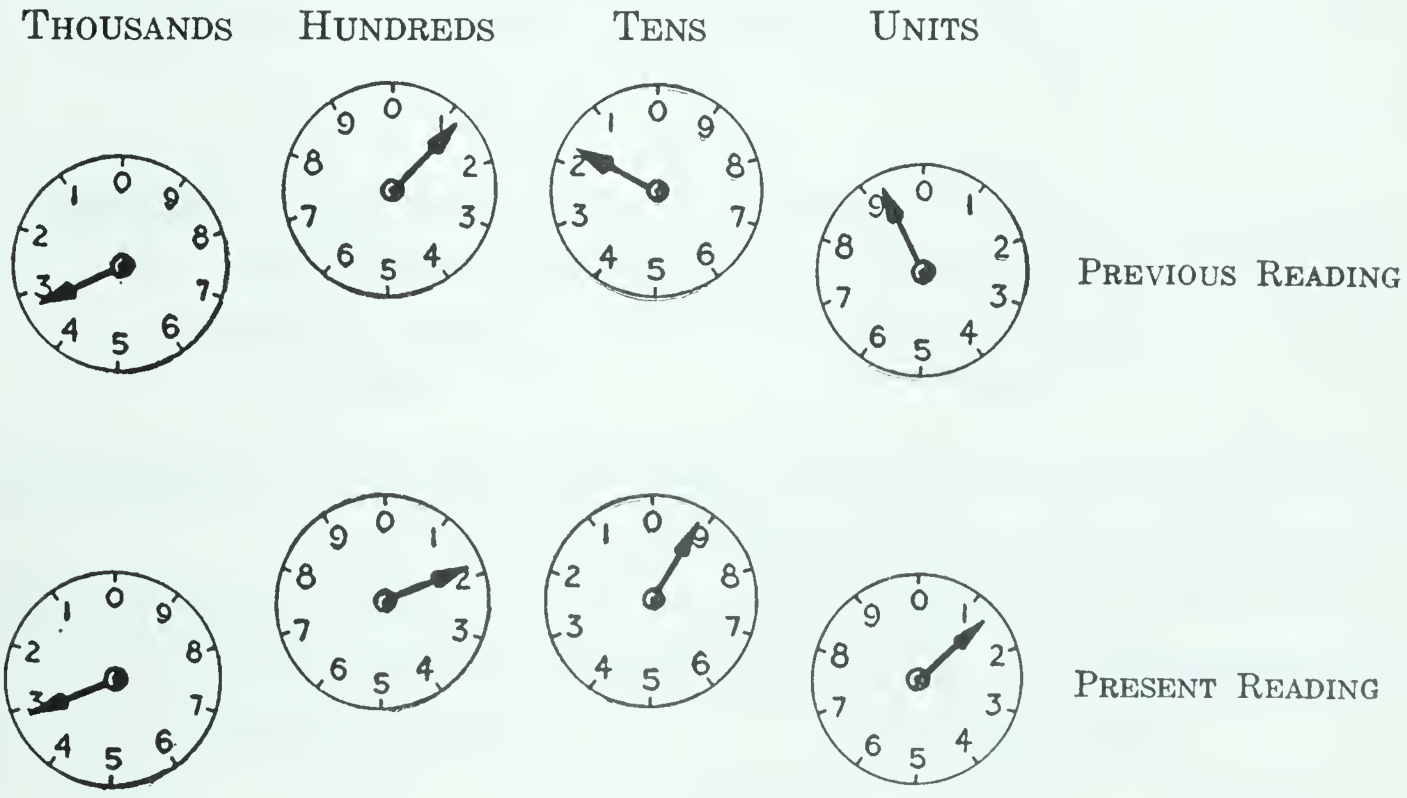
1832	reading January 1
1775	reading December 2
57	kwh used

Read the dials shown below and compute the number of kwh used in each period.

1.


THOUSANDS
HUNDREDS
TENS
UNITS
PREVIOUS READING
PRESENT READING

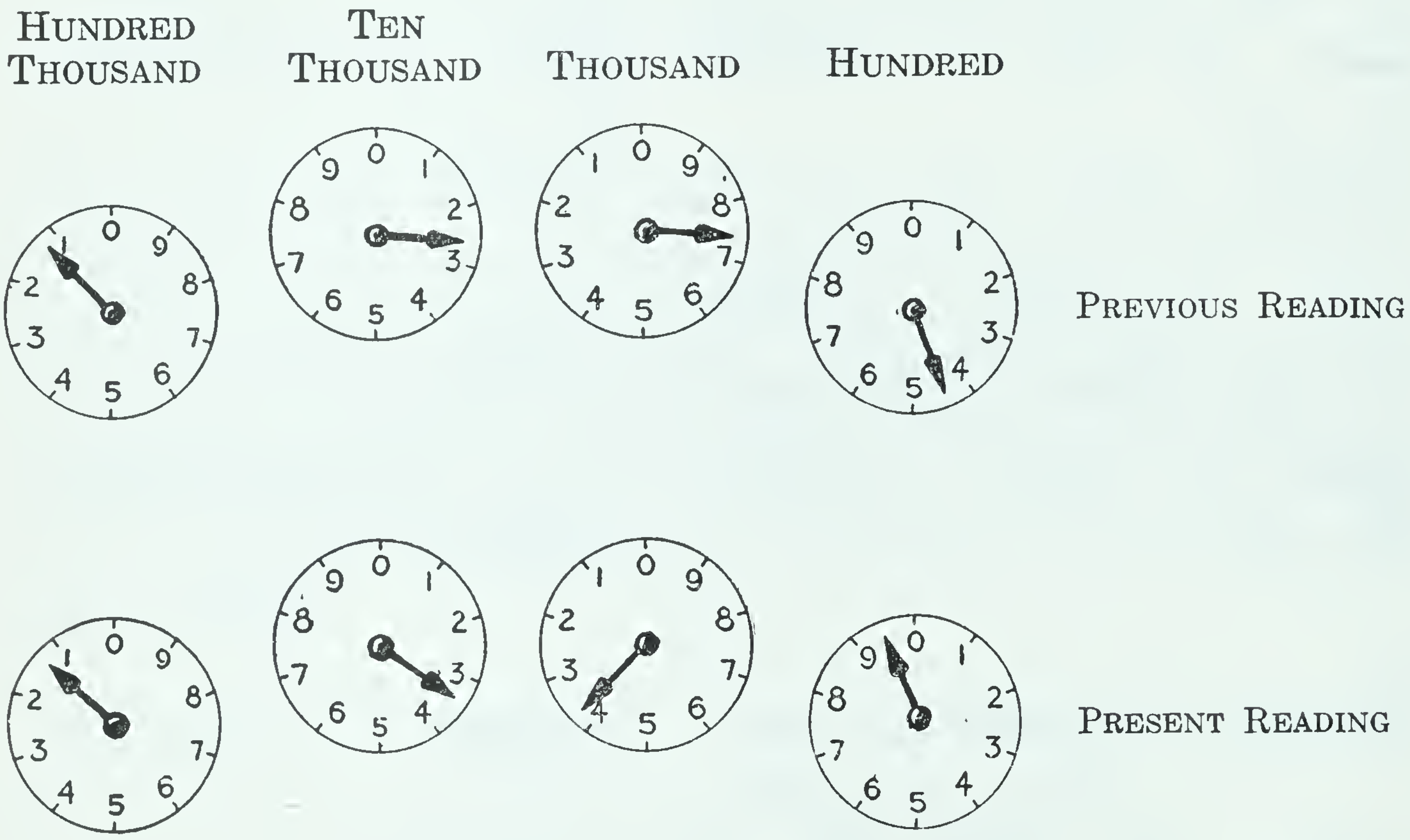
2.


THOUSANDS
HUNDREDS
TENS
UNITS
PREVIOUS READING
PRESENT READING

Reading gas meters

The dials on a gas meter look much like those on an electric meter. The main difference is that they register a different unit of measure. The gas meter indicates the number of cubic feet of gas, since this is the unit by which gas is sold. Also, there usually is no dial for either the tens or units place, as gas is sold at so much per hundred cubic feet and any amount less than one hundred cubic feet is neglected in any one reading.

These dials show two readings of a gas meter at the beginning of successive months. Read them and compute the amount of gas consumed. You should get 133,900 (present) – 127,400 (previous) = 6500 cubic feet (consumed).



Because the last two figures are always zeros, they are generally omitted from a gas bill. Thus, a bill might look like this:

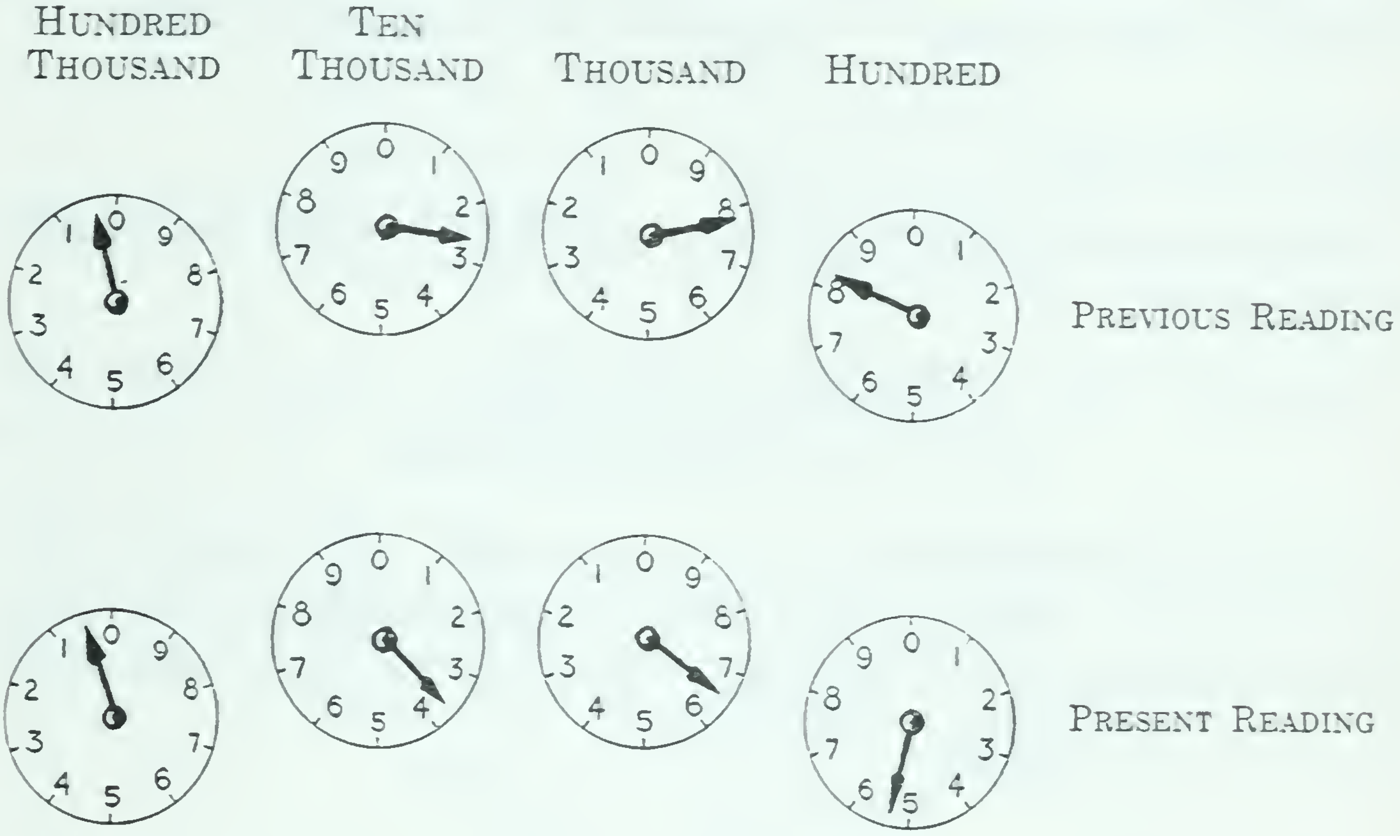
PREVIOUS READING	PRESENT READING
2283	2352

These two readings would indicate that 6900 cubic feet of gas had been consumed during the period covered by the bill.

Look at the two readings below and determine how many cubic feet of gas were consumed between the first and second readings:

PREVIOUS READING	PRESENT READING
4756	4873

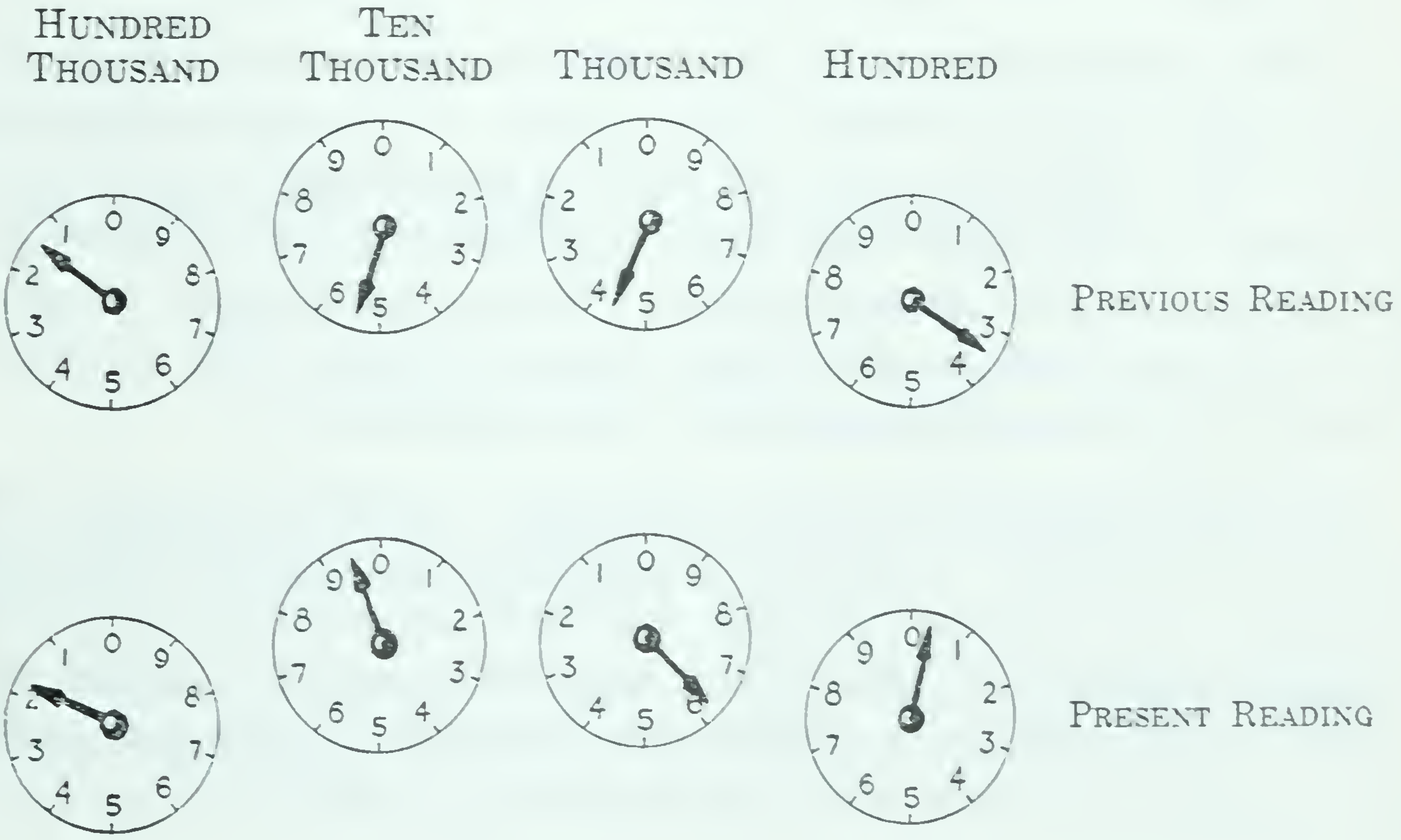
1. Read these dials and compute the amount of gas used between the two readings.


HUNDRED THOUSAND
TEN THOUSAND
THOUSAND
HUNDRED
PREVIOUS READING
PRESENT READING

Reading water meters

Water meters are read like gas meters. The unit of measure is the same — cubic feet.

1. How many cubic feet of water would the readings on the following dials indicate had been used between the two readings?


HUNDRED THOUSAND
TEN THOUSAND
THOUSAND
HUNDRED
PREVIOUS READING
PRESENT READING

Check electricity, gas, and water bills.

Ordinarily, on each bill from a public utility there is a table showing the rate at which charges for electricity, gas, or water are made.

Bills for electricity

Here are the rates Mr. Page found on the back of his electric light and power bill:

9¢ per kwh for first 10 kwh
4¢ per kwh for next 40 kwh
$2\frac{1}{2}$¢ per kwh for all over 50 kwh

His last bill showed that he had used 56 kwh. The amount of the bill was $2.85. Mr. Page had read the meters and concluded that 56 kwh was right. But he figured his bill should have been $2.65. Here is his computation. Was he right?

10 kwh at 9¢ = $ .90
40 kwh at 4¢ = 1.60
6 kwh at $2\frac{1}{2}$¢ = .15
$2.65

Using the rates quoted on Mr. Page's electricity bill, compute the amount of the bill for each of the following quantities of electricity:

1. 73 kwh
2. 32 kwh
3. 117 kwh
4. 226 kwh
5. 85 kwh
6. 89 kwh

7.* Mr. Anderson thinks that his family is careless about turning off lights when they are through using them. He estimates that six 40-watt light bulbs are burning at least $1\frac{1}{2}$ hours a day more than is necessary. If the Andersons used 172 kilowatt-hours of electricity last month, how much less would their bill have been if the six 40-watt light bulbs had been used $1\frac{1}{2}$ hours less every day? (Use a 30-day month and the rates given above for Mr. Page's bill.)

8.* Mrs. Anderson recalls that she turned the radio down but not entirely off one afternoon at four o'clock when she went to answer the telephone. She did not remember that she had done this until the following afternoon at two o'clock when she tuned in her favorite serial. If the radio was an 8-tube 100-watt model, how much would her oversight add to the Andersons' electric-light bill?

Gas bills

Mr. Page found this rate on the back of his gas bill:

First 300 cu. ft.	$.50
Next 1700 cu. ft.	.14 per 100 cu. ft.
Next 3000 cu. ft.	.13 per 100 cu. ft.
Next 5000 cu. ft.	.11½ per 100 cu. ft.
Over 10,000 cu. ft.	.08 per 100 cu. ft.

Mr. Page's last bill for 5600 cu. ft. amounted to $7.47. He said it was correct. Here is his computation:

First 300 cu. ft. =	$ .50
1700 cu. ft. at 14 cents a 100 =	2.38
3000 cu. ft. at 13 cents a 100 =	3.90
600 cu. ft. at 11½ cents a 100 =	.69
Total	$7.47

Using the rates listed on the back of Mr. Page's gas bill, compute the amount of the bill for each of the following quantities of gas:

1. 4800 cu. ft.
2. 2300 cu. ft.
3. 3200 cu. ft.
4. 1400 cu. ft.
5. 7800 cu. ft.
6. 15,100 cu. ft.

Water bills

Mr. Page found this rate on the back of his water bill:

First 1500 cu. ft.	15 cents per 100 cu. ft.
Next 98,500 cu. ft.	9 cents per 100 cu. ft.
Over 100,000 cu. ft.	6 cents per 100 cu. ft.

1. Compute what Mr. Page's bill for the last quarter of a year should be if he had used 17,000 cu. ft. of water.

2. Compute what Mr. Page's water bill should have been for each of the preceding quarters if his consumption was 14,800 cu. ft., 23,100 cu. ft., and 15,000 cu. ft., respectively.

PROBLEM III

How Do You Compute Discounts?

Look at the following advertisement:

15% Discount on All Sports Apparel
Purchased at Sports Center
During the Month of November

Do you know what a discount is and how to compute it?

Each article that is put up for sale is given a ***marked price*** at the time it is first displayed. If this marked price is reduced, the article is said to be sold at a *discount* and the amount of the reduction is the ***discount.*** In the above advertisement the discount is 15% of the marked price. The actual cost to the purchaser after discount is called the ***net price*** or ***sale price.*** An article may be sold with a *single,* or *simple, discount* or with *several discounts.*

Compute simple discounts.

First make certain that you understand how to compute a simple discount. There are many reasons why a merchant may be willing to sell you merchandise, such as a coat, for less than the marked price. Can you mention a few? Perhaps you see a coat that you like and it is marked $38, with a tag which says "20% discount." In that case, if you want the coat you think: The discount is 20% of $38, or __?__; the cost is $38 less __?__, or __?__.

Problems in Simple Discount

1. Here are Mrs. Kern's monthly bills for electricity:

January	$7.50	May	$5.60	September	$5.00
February	8.25	June	4.90	October	5.10
March	6.50	July	4.70	November	6.10
April	5.90	August	4.80	December	7.30

(*a*) How much was Mrs. Kern's total bill for the year?

(*b*) Mrs. Kern received a discount of 2% for paying her bill each month within 10 days. How much could she save a year by making prompt payments? (Use total annual bill.)

2. Henry works in a department store. He can buy for the family at a discount of 8%. How much did he save the family during the year if his monthly purchases were as shown below?

January	$15.20	May	$7.20	September	$5.00
February	24.42	June	18.05	October	14.50
March	10.80	July	18.20	November	18.00
April	12.20	August	17.60	December	42.60

3. How much would you pay for a bicycle marked $24 with a discount of 10% for cash?

4. Copy and complete the following:

ARTICLE	MARKED PRICE	RATE OF DISCOUNT	DISCOUNT	NET PRICE
Book	$ 2.40	15%	?	?
Bicycle	$42.50	10%	?	?
Table	$52.00	8%	?	?
Overcoat	$49.50	30%	?	?

There is probably no arithmetic problem that strikes you as often when you haven't a pencil with you as the one involving discounts. Therefore, it will be worth while to try this list without using a pencil (except to record your answers).

Find the cash price for goods listed:

5. 75¢ less $\frac{1}{3}$
6. $5.60 less 25%
7. $7.50 less $\frac{1}{5}$
8. $40 less 10%
9. $7 less 4%
10. $6 less $12\frac{1}{2}\%$
11. $48 less $16\frac{2}{3}\%$
12. $1.95 less $\frac{1}{3}$
13. $45 less 50%
14. $76 less 25%
15. $500 less 5%
16. $45.75 less 6%
17. $17.95 less 20%
18. $750 less $\frac{1}{5}$
19. $28 less 1%
20. $43.75 less 10%
21. $60 less 14%
22. $40 less $12\frac{1}{2}\%$
23. $24 less 2%
24. $96 less $37\frac{1}{2}\%$
25. $7.60 less $\frac{1}{8}$
26. $72.72 less $16\frac{2}{3}\%$
27. $34 less $\frac{1}{2}$
28. $27 less 10%
29. $32 less 25%
30. $200 less 15%
31. $16 less $6\frac{1}{4}\%$

(Continued on next page)

32. $54 less 33⅓%
33. $272 less ¼
34. $350 less 40%
35. $36 less 2.5%
36. $60 less 20%
37. $70 less 10%
38. $38 less ¼
39. $3.75 less 33⅓%
40. $25 less 4%
41. $76.50 less 5%
42. $603 less 33⅓%
43. $50 less 14%
44. $12 less 8⅓%
45. $16 less 30%
46. $9 less 20%
47. $45 less 80%
48. $55 less ⅒
49. $33.75 less ⅓
50. $65 less 6%
51. $16 less ½%
52. $18 less 10%
53. $36 less ⅛
54. $48 less 20%
55. $33.75 less 10%
56. $162.50 less 50%
57. $28 less 1%
58. $16.60 less 5%
59. $20 less 20%
60. $130 less 40%
61. $50 less 20%
62. $5 less 20%
63. $2.40 less ¼
64. $18 less 33⅓%

Compute several discounts.

Often *several* discounts in a series are made on the same merchandise. It may be subject to one discount because the immediate demand is small, to a second discount if the customer buys a large amount, and to a third discount if a cash payment is made. Such discounts are usually limited to wholesale buying.

The first discount is figured on the list, or marked, price. The amount of this discount is subtracted from the list price and the second discount is figured on the remainder. If a third discount is allowed, it must be figured on the price after the second discount has been subtracted. Perhaps an illustration will help you to understand how this is done.

Suppose you are treasurer of a bicycle club and wish to purchase 20 bicycles. They are listed in the catalogue at $45 each, and are subject to discounts of 20%, 10%, and 10%. What will you have to pay for *each* bicycle?

First discount: 20% of $45 = $9; $45 − $9 = $36.
Second discount: 10% of $36 = $3.60; $36 − $3.60 = $32.40.
Third discount: 10% of $32.40 = $3.24; $32.40 − $3.24 = $29.16.

Cost to you is therefore $29.16.

Questions to Discuss and Problems to Solve

1. How much would you have to pay for 50 overcoats marked $40 with discounts of 10% and 10%?

2. As a buyer of radios you are allowed discounts of 10% and 30%. What would 12 radios cost if each is listed at $47.50?

3. In buying 30 dozen golf balls you can get discounts of 20%, 6%, and 2%. What is the cost per dozen if the list price is $18 per dozen?

4. Which is better for the buyer, a single discount of 30% or discounts of 20% and 11%? Why?

Find the net price of goods marked and discounted as follows:

5. $700, 10%, 5%
6. $400, 20%, 2%
7. $630, $33\frac{1}{3}\%$, 10%
8. $450, 20%, 5%
9. $3000, 40%, 10%
10. $27, 15%, 4%
11. $48, $12\frac{1}{2}\%$, 6%
12. $320, 10%, 10%
13. $72, 25%, 5%
14. $660, $33\frac{1}{3}\%$, 1%
15. $90, 5%, 10%
16. $300, $33\frac{1}{3}\%$, 5%
17. $640, $12\frac{1}{2}\%$, 4%
18. $1500, 40%, 20%
19. $740, 10%, 10%
20. $260, 20%, 3%
21. $3840, 25%, 5%
22. $280, $12\frac{1}{2}\%$, 10%

See if you can do these without a pencil.

Find the net price of goods marked and discounted as follows:

1. $800, 25%, 5%
2. $100, 10%, 20%
3. $600, $16\frac{2}{3}\%$, 5%
4. $750, $33\frac{1}{3}\%$, 10%
5. $440, 25%, 10%
6. $500, 20%, 20%

Which is better:

7. (*a*) Discounts of 20% and 20%, or (*b*) one discount of 40%?

8. (*a*) Discounts of 5% and 15%, or (*b*) one discount of 20%?

9. (*a*) Discounts of 15% and 5%, or (*b*) of 5% and 15%?

10. (*a*) Discounts of $16\frac{2}{3}\%$ and 10%, or (*b*) one discount of 25%?

PROBLEM IV

How May a Monthly Bank Account Statement Be Checked?

John Green has just received his monthly bank statement. This statement shows the amount of money in John's checking account at the start of the month, the amount after any deposits, and the amount after each withdrawal. The final figure in the last column is the amount in John's account at the time the statement is made out. Here is the way his statement looked.

STATEMENT OF ACCOUNT WITH

John Green
127 Grandview
Ann Arbor, Michigan

THE ANN ARBOR BANK
ANN ARBOR, MICH.

BALANCE FORWARD	DATE	CHECKS	DEPOSITS	DATE	BALANCES
	READ ACROSS	BALANCE FROM LAST STATEMENT ☞	121.99	FEB 28'53	121.99*
121.99	MAR 1'53	5.00—		MAR 1'53	116.99
116.99			185.00	MAR 4'53	301.99
301.99	MAR 6'53	33.20—		MAR 6'53	268.79
268.79	MAR 6'53	25.00—		MAR 6'53	243.79
243.79	MAR 7'53	69.62—		MAR 7'53	174.17
174.17	MAR 10'53	1.18—		MAR 10'53	172.99
172.99	MAR 11'53	3.18—		MAR 11'53	169.81
169.81	MAR 12'53	33.00—		MAR 12'53	136.81
136.81	MAR 14'53	10.00—		MAR 14'53	126.81
126.81	MAR 22'53	5.00—		MAR 22'53	121.81
121.81	MAR 25'53	2.75—		MAR 25'53	119.06
119.06	MAR 27'53	12.00—		MAR 27'53	107.06

PLEASE EXAMINE.
IF NOT CORRECT, REPORT AT ONCE.

☝
THE LAST AMOUNT
IN THIS COLUMN IS
YOUR BALANCE.

1. What month does this statement cover?

2. How many of John's checks were paid by the bank that month?

3. What was his balance at the end of the previous month? at the end of the month covered by the statement?

4. How many deposits did John make during the month?

To check his account, John used the ruled columns on the back of his statement and followed the printed directions. (See below.)

TO RECONCILE BALANCE AS SHOWN ON STATEMENT

SORT CANCELED CHECKS RETURNED HEREWITH NUMERICALLY OR BY DATE AND COMPARE WITH CHECKBOOK STUB.

1. SHOULD REPRESENT ALL OUTSTANDING CHECKS WHICH HAVE NOT BEEN CHARGED TO THE ACCOUNT.
2. ENTER BALANCE AS SHOWN BY YOUR CHECKBOOK.
3. IF ALL DEPOSITS HAVE BEEN CREDITED, THE TOTAL OF LINE 1 AND 2 SHOULD AGREE WITH THE BALANCE AS SHOWN ON THE FACE OF THE STATEMENT.
4. IF ANY DEPOSITS HAVE NOT BEEN CREDITED ON STATEMENT, ENTER SAME ON LINE 4 AND DEDUCT FROM LINE 3.
5. LINE 5 SHOULD THEN AGREE WITH THE BALANCE AS SHOWN ON THE FACE OF THE STATEMENT.

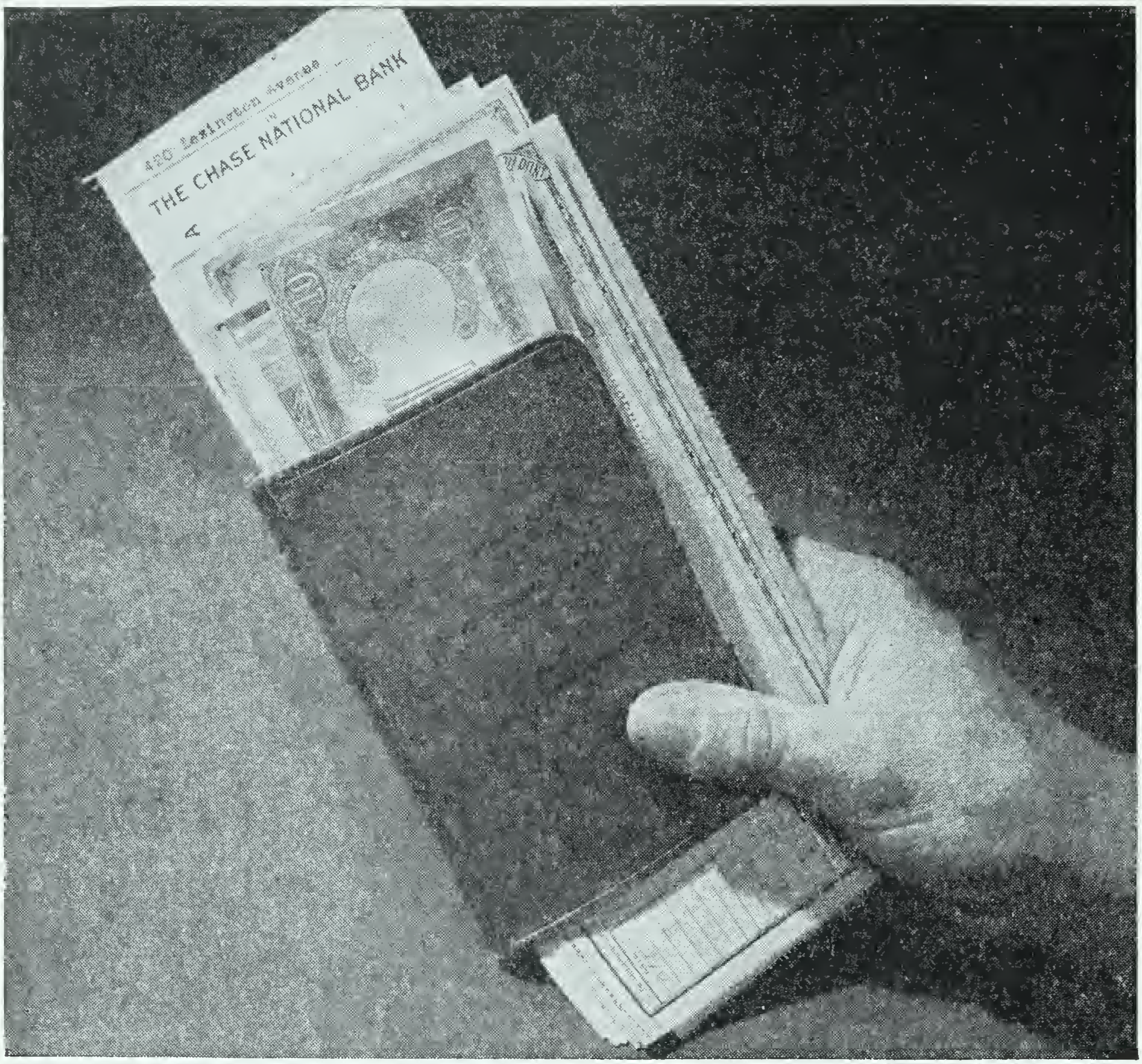
LIST BELOW ALL OUTSTANDING CHECKS

NO.	AMOUNT		
83		1	25
87		17	00
88		3	18
90		15	80
1. TOTAL OUTSTANDING CHECKS		37	23
2. BALANCE FROM CHECKBOOK		259	83
3. TOTAL	$	297	06

4. DEDUCT DEPOSITS NOT CREDITED BY BANK (IF ANY) $ 160.00

5. TOTAL $ 137.06

How much more does John's account show his balance to be than is shown in the bank's statement? When John checked further to find where the error occurred, he discovered that he had entered a deposit of $30 on his checkbook stubs, but had failed to deposit the check at the bank. What are some other errors that might possibly have caused the difference between John's account and his bank's?



Ewing Galloway

Questions to Discuss and Things to Do

1. Here are the facts for five months of Paul Henley's bank account. For which months did his account check with his bank's statement? What were the amounts of the errors for the months when his account did not balance with the bank's?

	APRIL	MAY	JUNE	JULY	AUGUST
Total outstanding checks	43.44	60.75	38.25	52.50	75.00
Balance from checkbook	139.74	206.03	89.29	111.87	115.23
Total..............	?	?	?	?	?
Deposits made after statement was issued, and not yet credited by bank...	30.00	50.00	25.00	75.00	60.00
Balance shown on bank statement............	153.18	206.78	102.54	89.27	115.23
Total..............	?	?	?	?	?

2. If a checking account is small, a bank generally either charges a stipulated amount for each check cashed or deducts service charges from the account when many checks are drawn. Here is the schedule of charges for one bank.

A. Lowest balance during month less than $100, 50 cents flat charge plus 3 cents per check beyond free checks allowed as follows:
- 5 free when lowest balance is less than $60
- 6 free when lowest balance is more than $60 but less than $70
- 7 free when lowest balance is more than $70 but less than $80
- 8 free when lowest balance is more than $80 but less than $90
- 9 free when lowest balance is more than $90 but less than $100

B. Lowest balance during month more than $100.
No flat charge. One free check for each $10 of lowest balance at any time during the month, and 3 cents a check for all beyond number of free checks allowed.

Under this schedule, what would be the service charges for the following accounts?

	LOWEST BALANCE DURING MONTH	NUMBER OF CHECKS DRAWN	CHARGES
(*a*)	$50	6	?
(*b*)	75	10	?
(*c*)	83	5	?
(*d*)	120	15	?
(*e*)	200	25	?

3. If the lowest balance at any time during the month is $300, how many checks can be drawn during that month and still hold the service charges to 45 cents?

Special investigations

4. If possible, arrange to see a monthly bank statement on the account of some athletic activity or other organization of your school. Carry out the steps suggested in Exs. 1 and 2 and see if the account balances.

5. If possible, arrange with your parents to let you check the last bank statement for your family. (Since the financial affairs of a home should in general be considered only within the family circle, this report should not be made to the class.)

PROBLEM V

What Mathematics Is Needed by the Beginner in a Small Business?

A study of the mathematics needed by young workers in small businesses on their first jobs suggests that most of the problems not treated in other units relate to a small number of specific tasks. These tasks include the following:

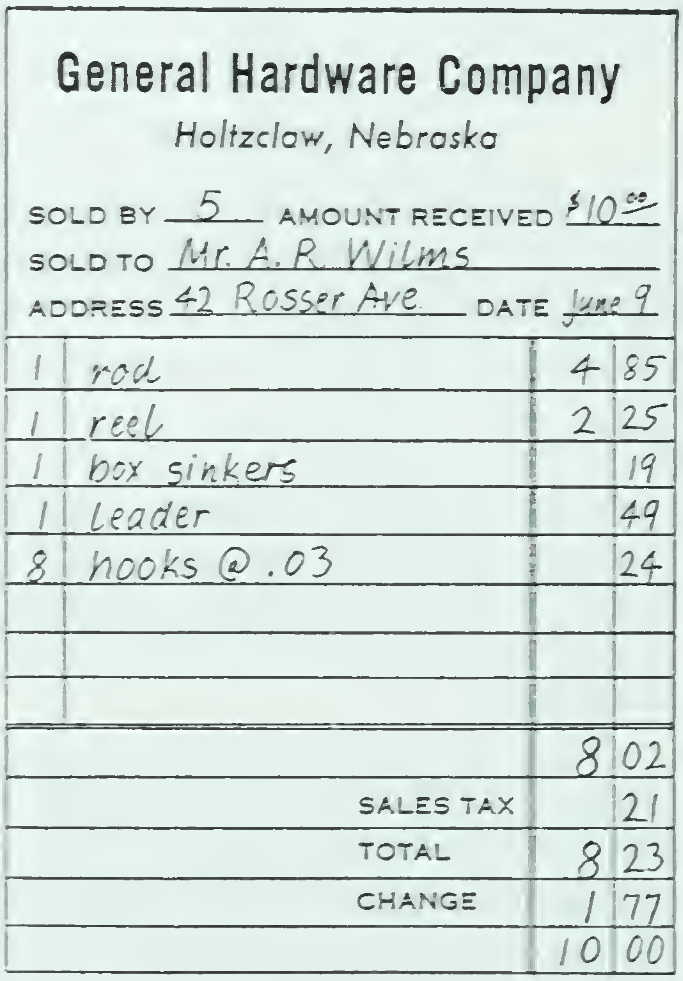
Making out a sales slip
Making change
Making out bills
Writing checks
Keeping an account on a check stub
Making a bank deposit
Sending money by money order or by wire
Writing a receipt
Keeping a customer's account
Making out a payroll
Computing profit and loss
Computing commission

Making out a sales slip.

When you buy an article, the clerk makes out a *sales slip.*

A sample is shown here. What items are written on the sales slip? Ordinarily, if you pay cash, the clerk fills out the sales slip completely and that slip serves as a receipt for the money you paid. Sometimes, instead of filling out the amount received and the change items, the clerk marks "Paid" on the slip and adds his initials. If you do not pay cash, the "Amount received" and the "Change" items are left blank. However, you should form the habit of saving sales slips in order that you may check the items on your bill when you get it.

The sales tax is ? per cent in this city.



General Hardware Company
Holtzclaw, Nebraska

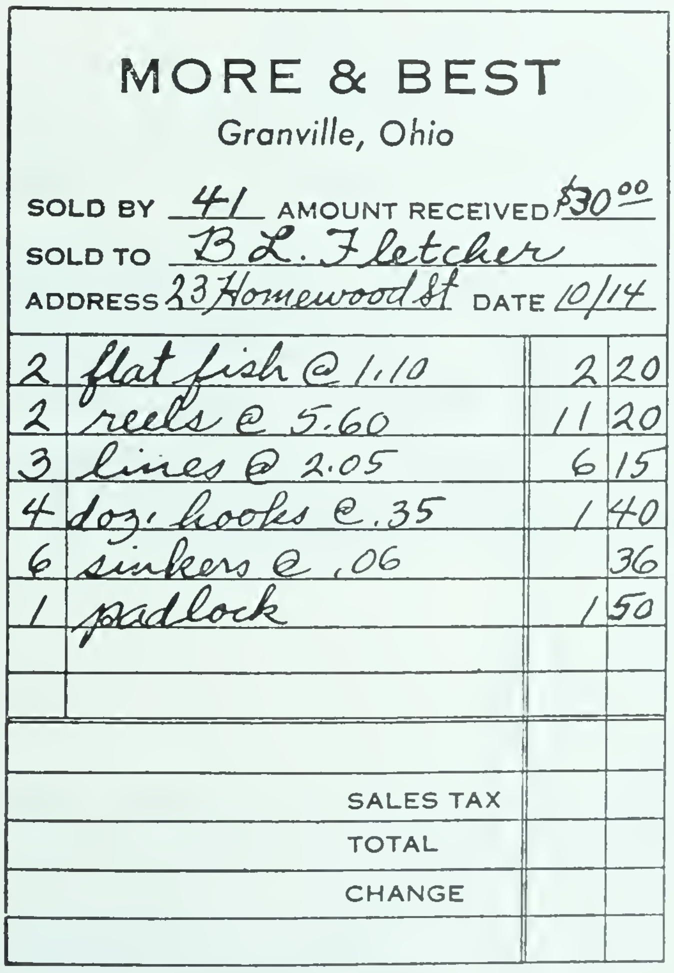
SOLD BY 5 AMOUNT RECEIVED $\$10^{00}$
SOLD TO Mr. A. R. Wilms
ADDRESS 42 Rosser Ave. DATE June 9

1	rod	4	85
1	reel	2	25
1	box sinkers		19
1	Leader		49
8	hooks @ .03		24
		8	02
	SALES TAX		21
	TOTAL	8	23
	CHANGE	1	77
		10	00

1. If possible, secure enough sales slips to supply all members of the class. Make up a problem and copy it on the blackboard. Each student practices making out the sales slip in the right way. You may fill in any names, places, and dates that you wish. When the cost of an item contains a fraction of a cent, charge the next higher whole number of cents.

2. Make out a sales slip[1] with the following items: The business place is the Doak General Store. The purchaser is Mrs. R. D. Zander. The articles bought with their prices are $4\frac{1}{2}$ yards of gingham at 48 cents; 32 yards of flannel at $27\frac{1}{2}$ cents; and 28 yards of muslin at 45 cents. The sales tax is 2%. Amount received, $30.

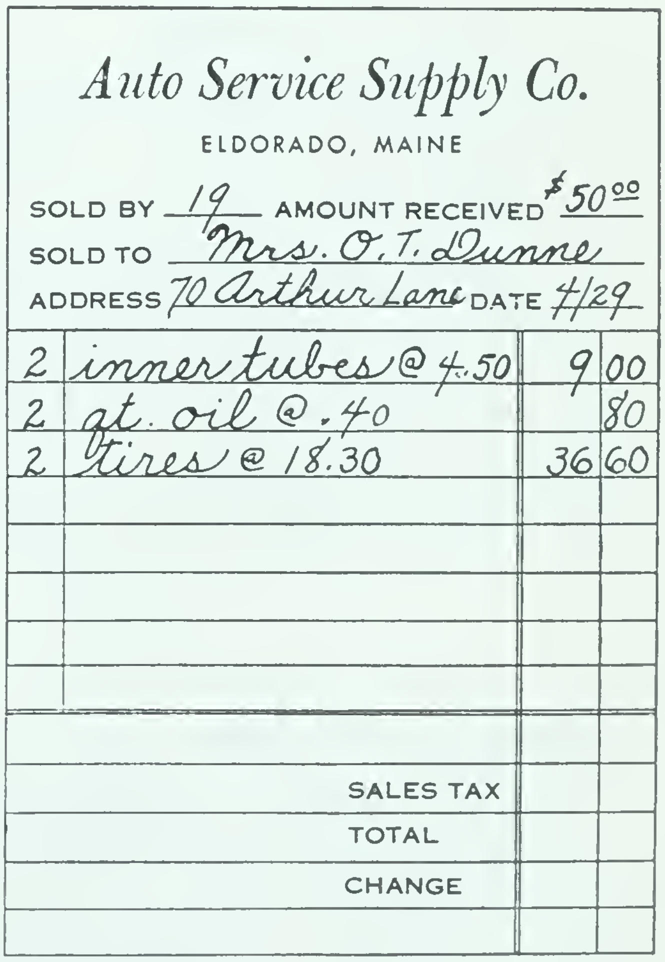
3. Find the total of each of the sales slips shown below. Do not write on this page but make a copy of the bottom part, beginning with line above "Sales tax," on a work sheet. If the local sales tax is $2\frac{1}{2}$%, fill out the sales slips.



MORE & BEST
Granville, Ohio

SOLD BY 41 AMOUNT RECEIVED $30.00
SOLD TO B L. Fletcher
ADDRESS 23 Homewood St DATE 10/14

2	flat fish @ 1.10	2	20
2	reels @ 5.60	11	20
3	lines @ 2.05	6	15
4	doz. hooks @ .35	1	40
6	sinkers @ .06		36
1	padlock	1	50
	SALES TAX		
	TOTAL		
	CHANGE		



Auto Service Supply Co.
ELDORADO, MAINE

SOLD BY 19 AMOUNT RECEIVED $50.00
SOLD TO Mrs. O. T. Dunne
ADDRESS 70 Arthur Lane DATE 4/29

2	inner tubes @ 4.50	9	00
2	qt. oil @ .40		80
2	tires @ 18.30	36	60
	SALES TAX		
	TOTAL		
	CHANGE		

---

[1] TO THE TEACHER. These exercises can be used to provide an excellent work period. In the first exercise the students experiment informally with the forms. The second or third may well be used as a formal test. Several students may serve as assistants to give help and to accept or reject the papers as they are submitted. (Sales taxes are discussed in detail in Unit VII.)

Making change.

As a clerk you would be expected to make change in as few coins (and paper currency) as possible, unless otherwise requested. The common method is to state the cost, then add coins until the amount offered in payment is reached. Assume that you are a clerk in a grocery store and that a customer has bought a head of lettuce costing 13 cents and that he has given you a 1-dollar bill in payment. As you prepare to give the customer his change, you say, "Thirteen cents." Then, as you place the change piece by piece in the customer's hand, you say, "Fourteen, fifteen, twenty-five, fifty, one dollar." What coins were used? Was the smallest possible number of coins used to make up the change?

Make change for the following with the fewest possible coins and paper currency:

1. 3¢ out of a quarter
2. 25¢ out of a dollar
3. 30¢ out of a dollar
4. $1.20 out of $2
5. $3.13 out of $5
6. $1 out of $20
7. 57 cents out of $10
8. $3.40 out of $10
9. 27¢ out of $5
10. $1.43 out of $5

11. Fred Long made a $2.47 purchase in a hardware store. He gave the clerk a $10 bill and waited for his change. In the drugstore next door, he used the largest bill he had received in change to make a $3.69 purchase. If each clerk gave Fred the least possible amount of change, what bills and coins did he have when he left the drugstore?

Making out bills.

Doctors, dentists, and stores send bills to persons for services rendered or goods bought. (Bills from public utilities were discussed on pages 214–215.) A bill is an itemized account of what one person or company owes another for goods or services. When a bill is paid by cash, the person who receives the money usually writes "Paid" across the face of the bill and returns the bill, which then serves as a receipt. He should also write the date of payment and his own initials.

1. Here is a bill that is not completely made out.

TAYLOR DRUG STORES

610 Elm Street
New Britain, Conn.

May 30, 19—

Sold to: Mr. E. J. Fletcher
18 Maple Street
New Britain, Conn.

May 1	2 tubes tooth paste	@ .27		54
6	4 toothbrushes	@ .49	1	96
9	5 dozen all-day suckers	@ .09		
		Total		

(*a*) What did 5 dozen all-day suckers cost at 9¢ a dozen?

(*b*) Find the total of the bill.

Totaling the cost of the items is called *footing* the bill.

2. If possible, secure enough bill forms from some small business place to supply all the students in the class. Make up a problem that would fit the particular business. Use the data of your problem to make out a bill. (When the cost of an item contains any fraction of a cent, charge the next higher whole number of cents.) You may fill in any names, dates, and places you wish.

3. Make out a bill for the following:

2 doz. towels	@ \$5.32
$4\frac{1}{2}$ yd. lace	@ .18
20 cakes soap	@ .09
2 pr. stockings	@ 1.69
3 pr. socks	@ .55

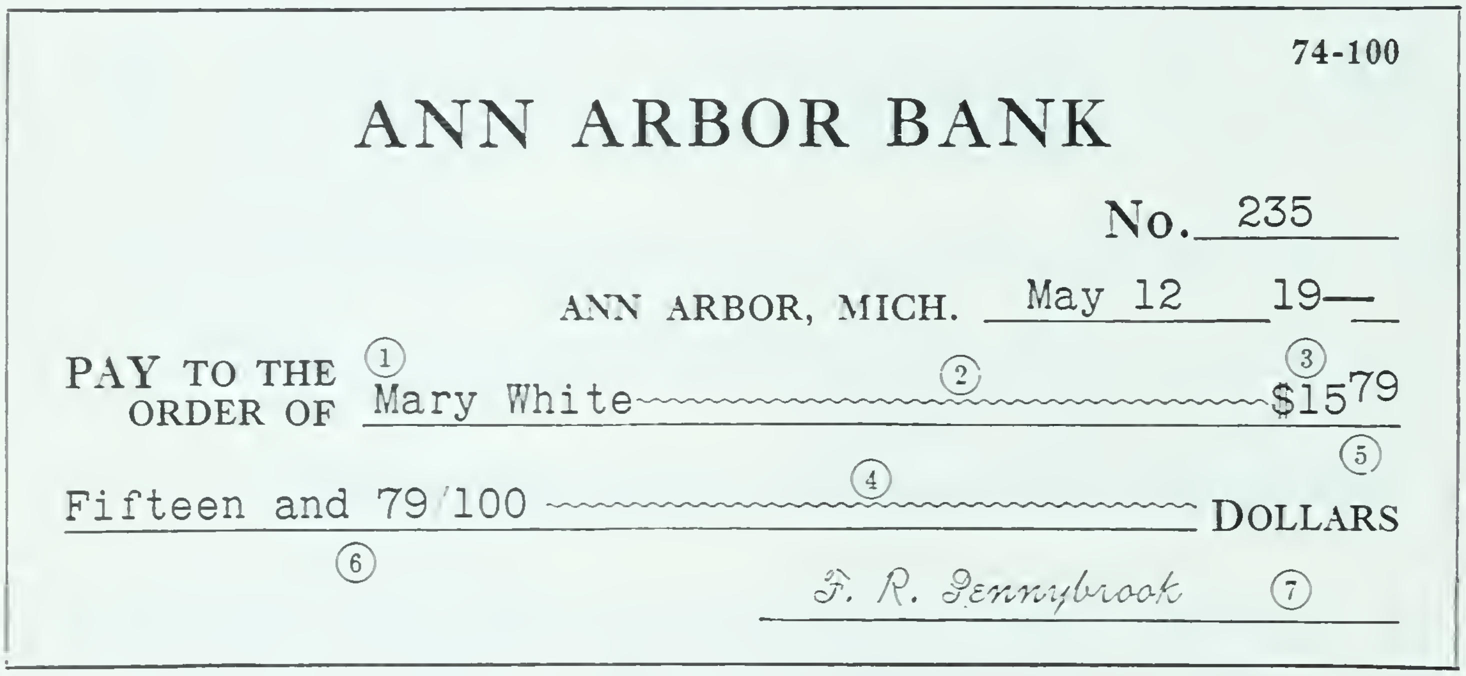
Special investigation *

4. Bring some bills to school for class examination and discussion. Include an *invoice*, which is an itemized statement (similar to a bill) that the dealer sends with each shipment of goods.

Writing checks.

Banks provide their customers with checkbooks. When a checking account is opened, by depositing money in the bank, the bank requires the customer to write his signature on a card which is kept in a file at the bank. Then, as long as there are sufficient funds in the account, a check with this signature on it will be paid by that bank.

There are several things to be careful about in writing a check. Below is a check made out. The points to watch are noted for you.



74-100

ANN ARBOR BANK

No. 235

ANN ARBOR, MICH. May 12 19—

PAY TO THE ORDER OF ① Mary White ② ③ $15^{79}

⑤

Fifteen and 79/100 ④ DOLLARS

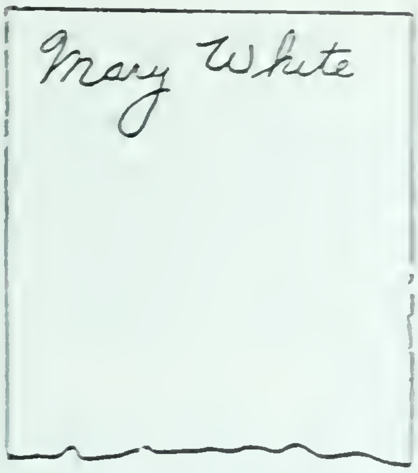
⑥

F. R. Pennybrook ⑦

At points (1), (2), (3), and (4) it is highly important that no spaces be left. If all the space is filled, it is difficult for anyone to change the check after the signature has been written. At point (5) be careful that the cents part of the amount is written slightly above the dollars part. Be sure at point (6) that the amount is the same as that at point (5). Finally, at point (7) be sure that your signature is the same as that which you used when you opened the account. (Don't change from initials to first name or from name to initials.)

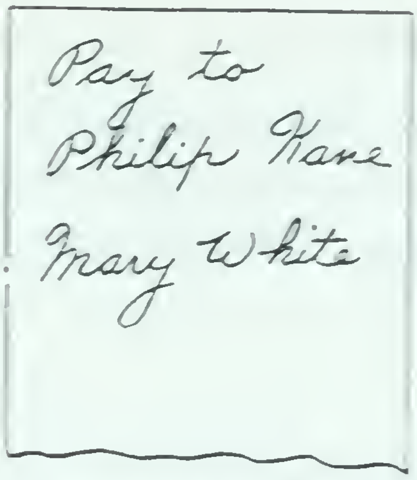
Obtain from the nearest bank some blank checks and practice making out checks to classmates. Be sure to destroy each check or write "Void" across it after you have finished making it out and your teacher has inspected it.

Before Mary White can get the cash for her check or even before she can deposit it, she must *endorse* it. That is, she must write her name on the back of the check at the left-hand end (*endorsed in blank*). This endorsement indicates that, if the check is no good, Mary White will be responsible for it. With the endorsement, it is possible for



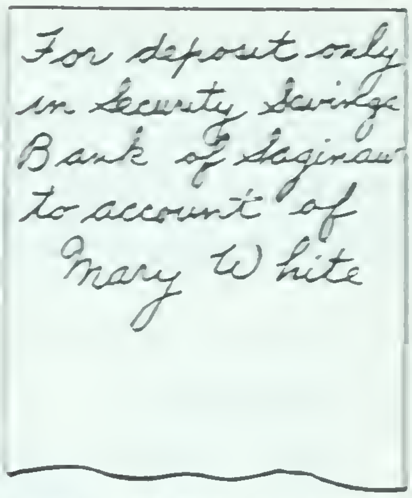
Mary White

Endorsed in Blank



Pay to
Philip Kane
Mary White

Endorsed in Full



For deposit only
in Security Savings
Bank of Saginaw
to account of
Mary White

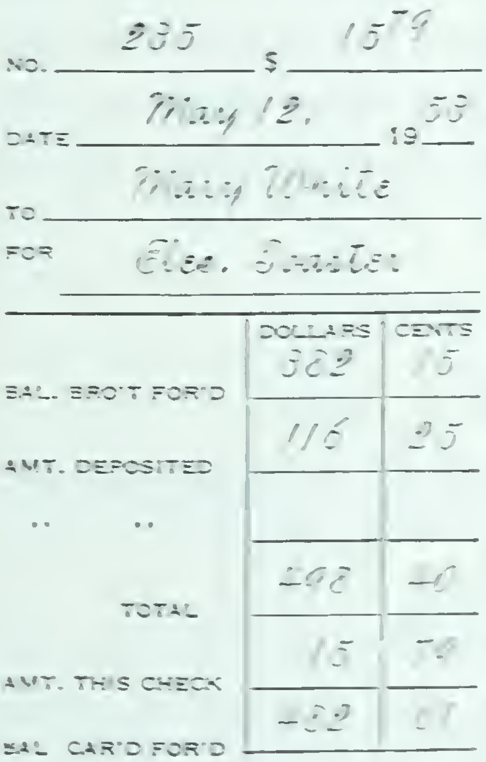
Restricted Endorsement

Mary to use the check where she is known even if Mr. Pennybrook is not known. However, another person can endorse below Mary White's signature; so she should not endorse the check until she is actually ready to use it.

If Mary White wishes to have another person, say Philip Kane, cash the check, she can endorse it *in full*. Or, if she wishes to have someone deposit the check for her, she may use a *restricted endorsement*.

Keeping an account on a check stub.

When F. R. Pennybrook wrote a check for Mary White, he also filled in a checkbook stub. Here is the way the checkbook stub for Mary White's check looked. It indicates that Mr. Pennybrook had a balance of $382.15 before May 12. On this date he deposited $116.25, making his total balance $498.40. When he subtracted the $15.79 for Mary White's check, his new balance was $482.61.



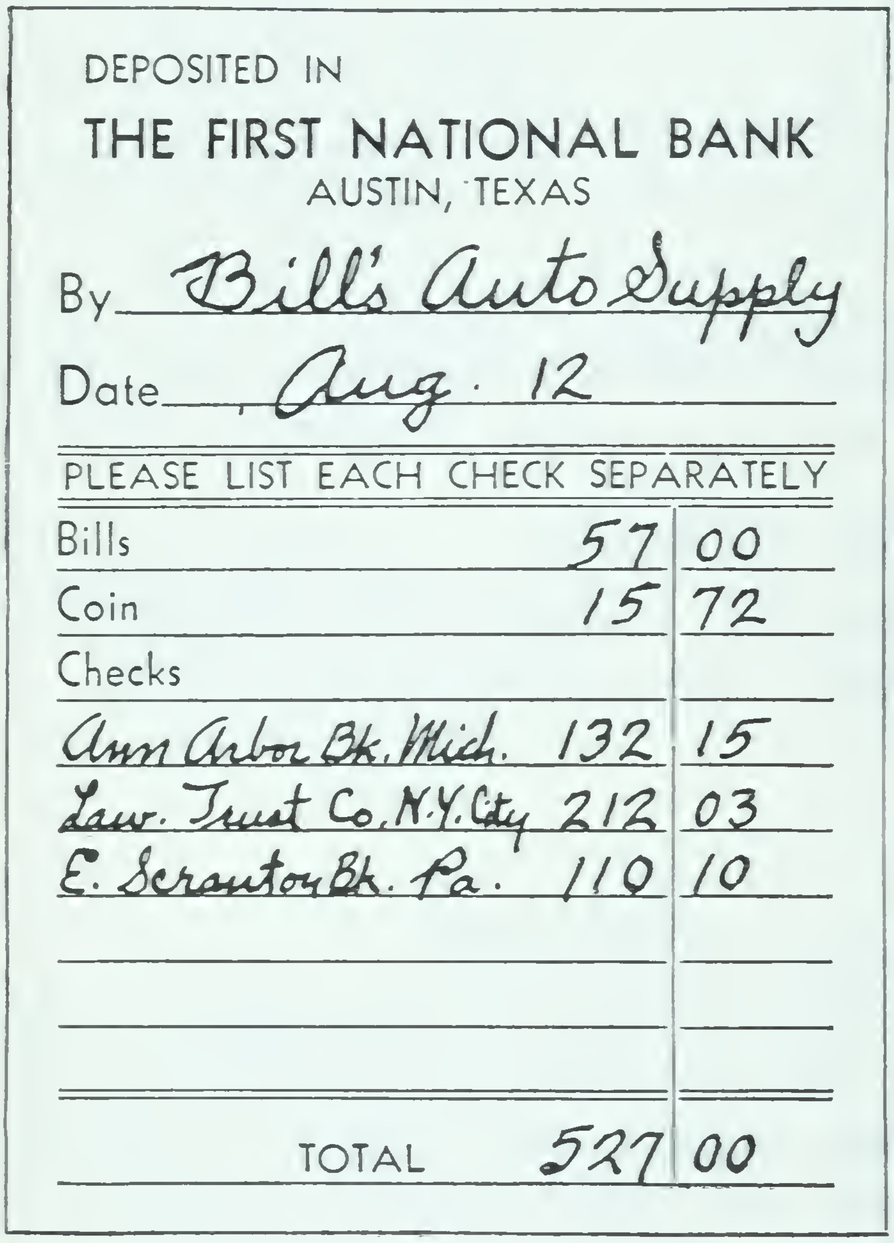
NO. 235 $ 15.79
DATE May 12, 1953
TO Mary White
FOR Elec. Heater

	DOLLARS	CENTS
BAL. BRO'T FOR'D	382	15
AMT. DEPOSITED	116	25
" "		
TOTAL	498	40
AMT. THIS CHECK	15	79
BAL. CAR'D FOR'D	482	61

Assume that the next check in Mr. Pennybrook's checkbook is to Paul Tyler for $23.97 and the check following is to Sam Jones for $115.23. The date for both is today. Make blank stubs and complete the necessary entries on the stubs. (There are no deposits to enter.)

Making a bank deposit.

Most business concerns deposit money in the bank daily. The bank furnishes a deposit slip on which the items of the deposit and the total amount must be indicated. Here is a copy of such a deposit slip made out for a deposit of $527.00.



DEPOSITED IN

THE FIRST NATIONAL BANK

AUSTIN, TEXAS

By Bill's Auto Supply

Date Aug. 12

PLEASE LIST EACH CHECK SEPARATELY

Bills	57	00
Coin	15	72
Checks		
Ann Arbor Bk. Mich.	132	15
Law. Trust Co. N.Y. City	212	03
E. Scranton Bk. Pa.	110	10
TOTAL	527	00

Banks are assigned numbers by the American Bankers Association (A.B.A.). These numbers indicate the location of each bank and may be used on deposit slips in place of the name of a bank. An A.B.A. number 74–100 is indicated in the upper right-hand corner of the check on page 228. The number 74–100 could have been used instead of the first bank listed in the deposit slip shown above.

Make copies of this deposit slip form or secure some from your bank. Use them to make out slips for the following deposits. (Assume names for banks in each case.)

1. Coins, $23.13; checks, $172.15, $212.07, $25.10.

2. Bills, $129.00; checks, $23.00, $15.17, $3.85, $96.58.

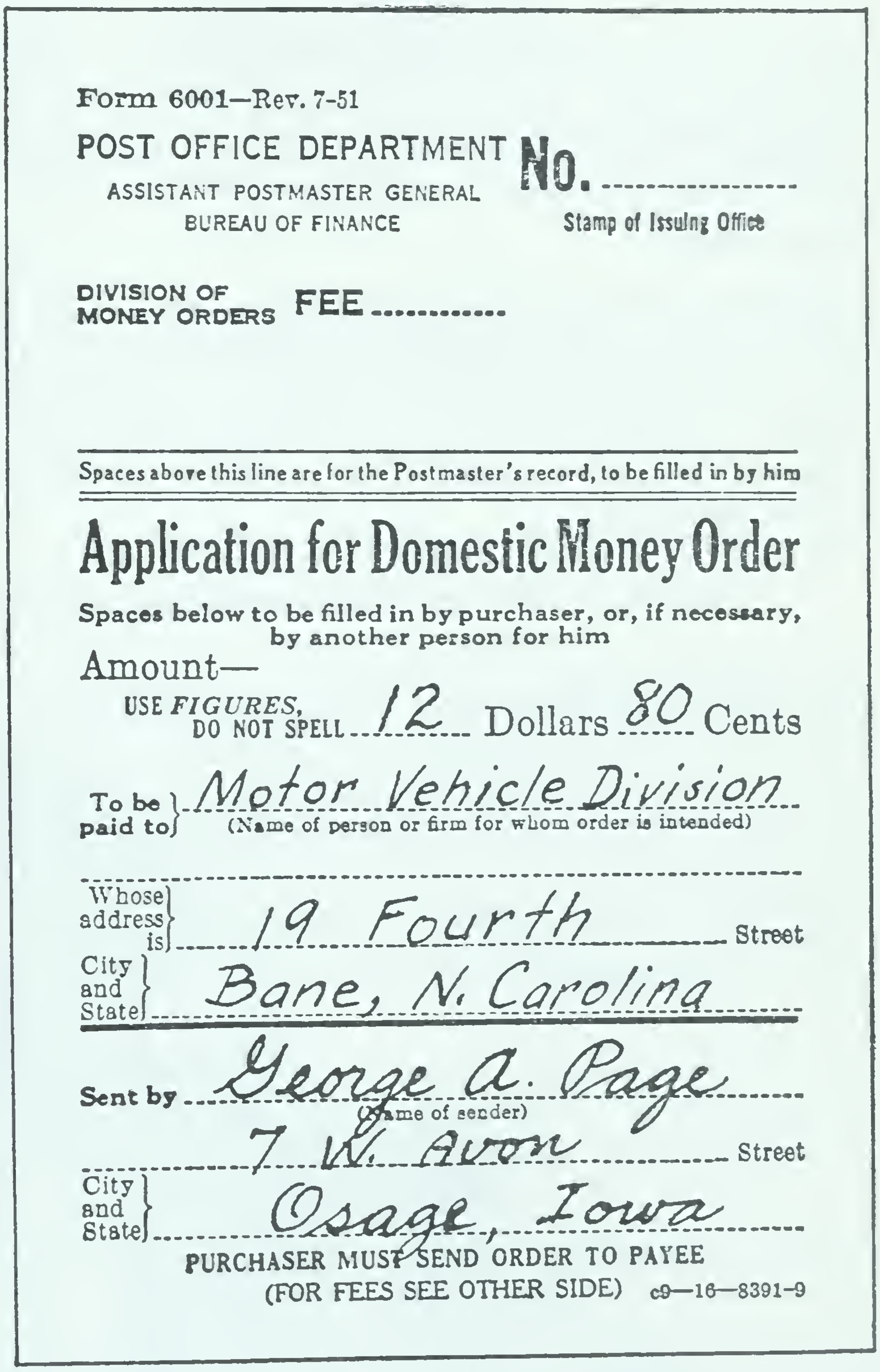
3. Bills, $15.00; coins, $23.18; checks, $172.00, $215.50, $23.98, $15.95.

4. Coins, $1.97; checks, $52.39, $146.45, $13.27.

5. Bills, $27.00; coins, $9.32; checks, $16.48, $42.97, $116.54, $92.16, $147.88.

Sending money by money order or by wire.

It is sometimes more convenient to send money by a money order than by bank check or draft. For example, Mr. Page is out of his home state when the time comes to get his automobile license. Since his present license expires in a few days, he will probably choose to send the money by money order. If he sends his bank check, the license plates may not be forwarded until the check has been returned to his bank for payment. With the money order there will be no delay. Here is the reason there is no question about the money order. When Mr. Page filled out the application blank, he deposited at the post office the amount of $12.80 in cash. When the money order is received, the receiver can present it at any post office and he will get in cash the amount indicated on the order.



Form 6001—Rev. 7-51

POST OFFICE DEPARTMENT
ASSISTANT POSTMASTER GENERAL
BUREAU OF FINANCE

No. ....
Stamp of Issuing Office

DIVISION OF MONEY ORDERS FEE ....

Spaces above this line are for the Postmaster's record, to be filled in by him

Application for Domestic Money Order

Spaces below to be filled in by purchaser, or, if necessary, by another person for him

Amount—
USE *FIGURES*, DO NOT SPELL 12 Dollars 80 Cents

To be paid to Motor Vehicle Division
(Name of person or firm for whom order is intended)

Whose address is 19 Fourth Street
City and State Bane, N. Carolina

Sent by George A. Page
(Name of sender)
7 W. Avon Street
City and State Osage, Iowa

PURCHASER MUST SEND ORDER TO PAYEE
(FOR FEES SEE OTHER SIDE) c9—16—8391-9

Julia Gregg had spent a month at summer camp, but she had also spent the money she had saved for her vacation. In reply to her request for $10.00 train fare, her parents sent a money order for the amount. Do you think Julia will find it easier to get her money than she would if her parents had sent a check? Why?

A fee is charged the sender of money orders. Here are the rates for postal money orders.

For Orders	*Rate*
From $0.01 to $5.00	10 cents
From $5.01 to $10.00	15 cents
From $10.01 to $50.00	25 cents
From $50.01 to $100.00	35 cents

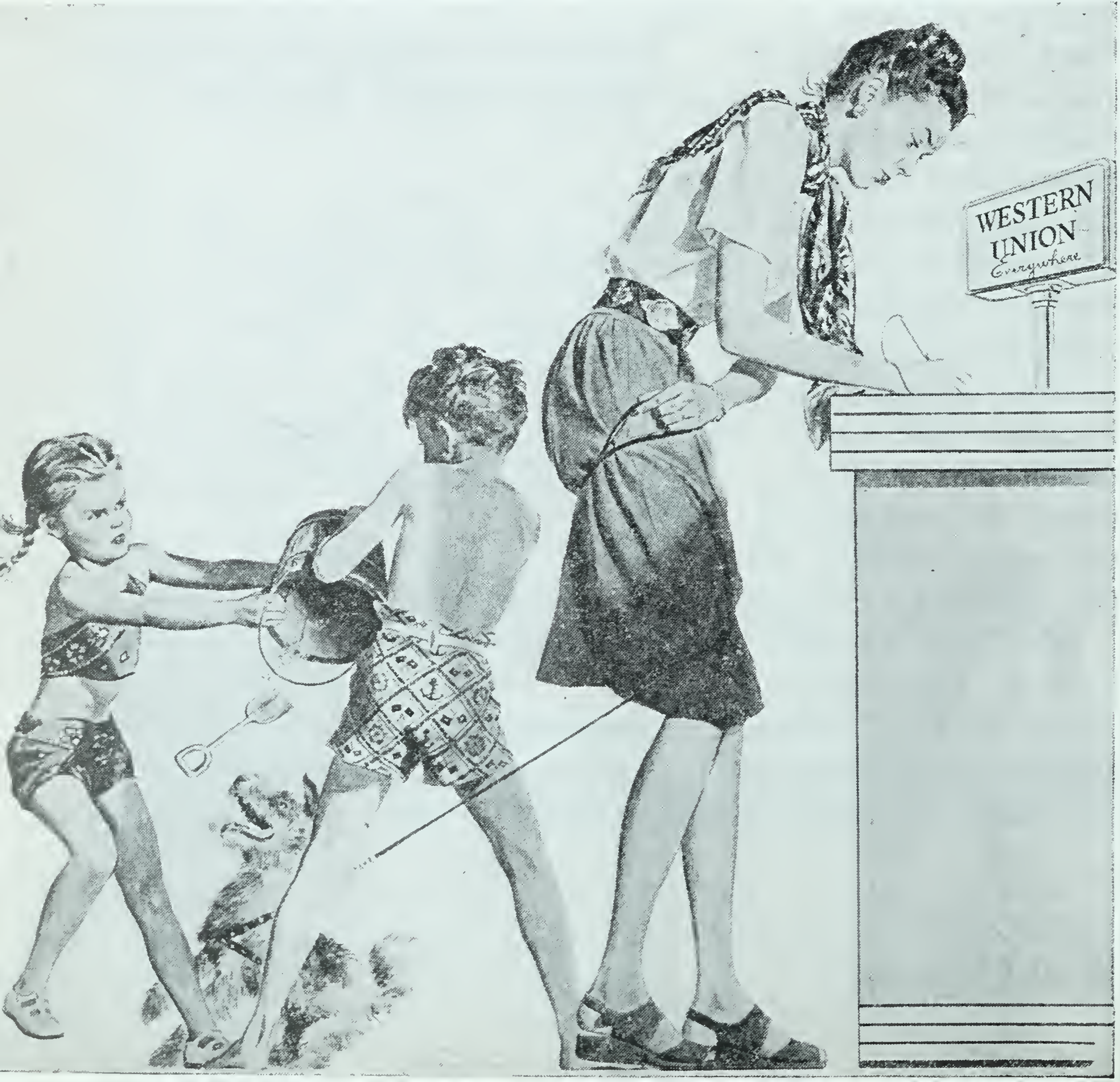
Not more than $100 can be sent by one postal money order. If a person desires to send more than $100, he must obtain more than one money order.

Express money orders are similar to postal money orders but are issued by express companies instead of by United States post offices. Both are accepted without question as payments of money.

Money may also be sent by means of a telegram in a somewhat similar manner.

By telegram money can be requested and delivered in a few hours.

Western Union Telegraph Company



1. Secure copies of application blanks for money orders and practice making them out. Use the names and addresses of friends or classmates.

2. What are the fees for postal money orders for the following amounts: (*a*) $23.28; (*b*) $72.50; (*c*) $56.28?

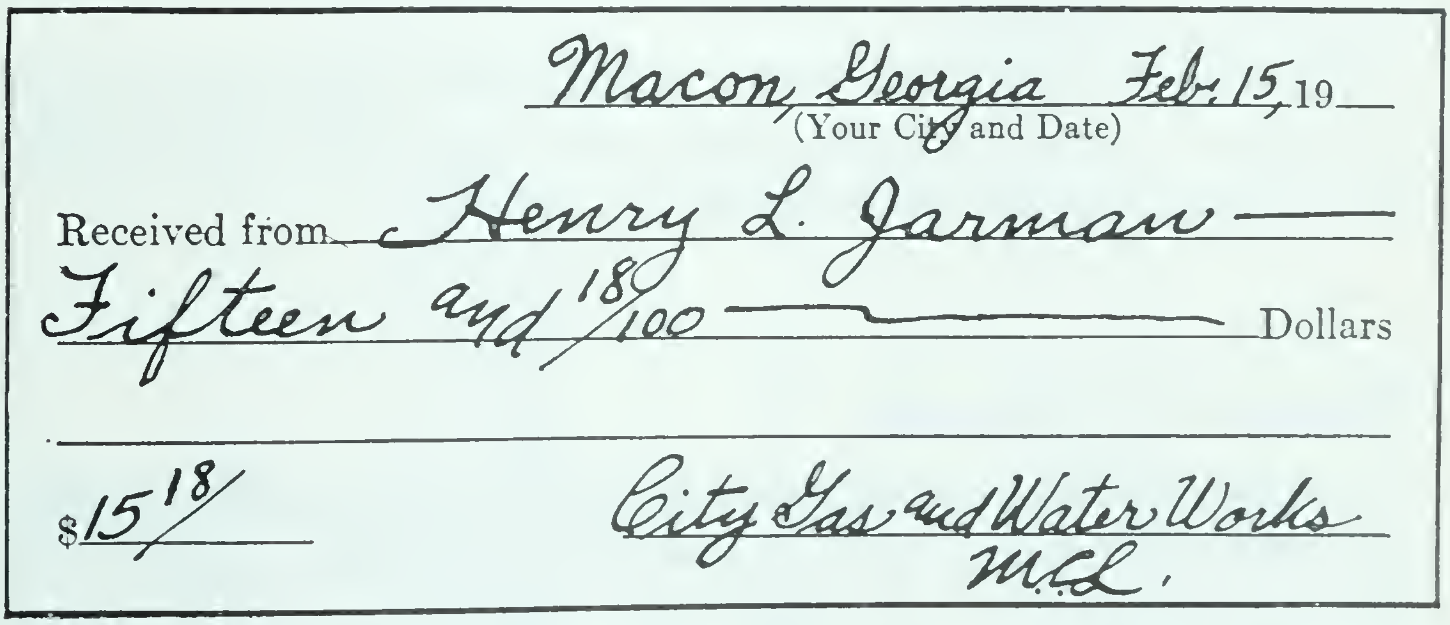
3. Bessie Green sent a postal money order air mail special delivery for $29.95 to buy a dress. How much should she have paid for the money order, the air-mail stamp, and the special-delivery stamp?

Writing a receipt.

When Mr. Jarman pays a bill, he requests a receipt. If he has his bill with him when he makes a payment or if he sends the bill by mail with his money order, the signed bill may serve as a receipt. The person to whom Mr. Jarman pays the money merely marks on the bill "Paid," then writes his signature and the date, and returns the bill to Mr. Jarman. This signed bill is a receipt.

If Mr. Jarman pays his bill by means of a check, the canceled check (returned to his bank) serves as a receipt. The canceled check shows that the receiver has cashed or deposited the check.

If Mr. Jarman does not have a bill when he makes his payment, he is likely to get a receipt like the one shown here. It indicates that Henry L. Jarman paid $15.18 to the City Gas and Water Works on February 15, 19—. The initials *M.C.L.* are those of the clerk who actually received the money from Mr. Jarman.



Macon, Georgia Feb. 15, 19
(Your City and Date)

Received from Henry L. Jarman

Fifteen and 18/100 Dollars

$15 18/

City Gas and Water Works
M.C.L.

Make copies of this receipt form or secure copies from a local store and practice writing receipts.

Keeping a customer's account.

When business is done on credit, there must be a record kept of each credit customer's account. This account shows the date of purchase, the name and amount of each article purchased, the cost of the purchase, and the total amount which the customer owes after each purchase or payment.

Here is a page from the customer's account book of the Millwood Department Store.

MILLWOOD DEPARTMENT STORE

M. J. Arnold, 206 Grade Street   August, 19——

Date	Item	Debits	Credits	Amount Due
Aug. 1	Carried forward from last month			5.40
3	3 ties	2.40		7.80
6	1 pr. shoes	6.50		14.30
15	Cash		10.00	4.30
23	1 suit	34.95		39.25
25	3 pr. socks	1.00		40.25
30	1 shirt	3.30		43.55

The cost of any purchase made by Mr. Arnold is placed in the "Debits" column. Any payments he makes are entered in the "Credits" column. The last column to the right is the "Amount Due" column, which shows how much Mr. Arnold owes after making a purchase or a payment.

Make a copy of this account form and prepare a customer's account for yourself. You can choose a store with which you or your family deals, and list probable purchases for one month.

Making out a payroll.

(1) The young worker may need to help in making out the payroll. Bert Jones, the manager of the Batesville News Agency, makes out a weekly payroll for the five persons who help him with distribution. At the top of the opposite page are some typical entries from his weekly payroll book.

No.	Name	Number of Hours Worked						Total Time	Wages per Hour	Total Wages
		M	Tu	W	Th	F	S			
1	C. Hosling	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{1}{2}$	2	13	85¢	$11.05
2	O. Shore	2	2	$1\frac{3}{4}$	2	$1\frac{1}{4}$	2		87¢	
3	G. Tupper	3	$2\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$	0	3		85¢	
4	S. K. Hill	$2\frac{1}{2}$	2	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{1}{2}$		89¢	
5	H. Chipman	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$		85¢	

Complete the payroll shown above. (Drop fractions of a cent.)

(2) Some firms still pay their employees in cash. In that case someone has to find out both the amount of money and the number of each kind of coin and bill needed to meet the payroll. Here is a sample of how this is done.

Employee	Wages
Helen Dixon	$45.38
James Walker	53.18
Billy Katz	42.65
Mary Dorrier	58.23
	$199.44

To find the bills and coins needed, you consider the wages for each employee, listing the largest bills first and the smallest coins last. For example, to pay Helen Dixon you will need two $20 bills, one $5 bill, one 25¢, one 10¢, and three 1¢. Here is the summary.

BILLS AND COINS NEEDED FOR PAYROLL

	No.	Amount
$50 bills	2	100.00
$20 bills	4	80.00
$10 bills	0	
$5 bills	2	10.00
$1 bills	8	8.00
50¢ coins	1	.50
25¢ coins	1	.25
10¢ coins	5	.50
5¢ coins	2	.10
1¢ coins	9	.09
		$199.44

Make out a week's payroll when the number of the employee, the hours each one worked, and the wages per hour are as shown in the two following exercises: (Drop fractions of a cent from any pay.)

1. No. 1. 7, 8, 8, $7\frac{1}{2}$, 6. 77 cents
No. 2. 8, 8, 7, 6, 7. 81 cents
No. 3. 8, $8\frac{1}{2}$, 7, $7\frac{1}{2}$, 6. 75 cents
No. 4. 7, 7, $7\frac{1}{2}$, 7, 8. 78 cents
No. 5. 8, 7, 7, 7, $6\frac{1}{2}$. 80 cents

2. No. 1. 7, 8, 8, 7, 8, 4. 75 cents
No. 2. 8, 7, $7\frac{3}{4}$, $6\frac{1}{2}$, 8, 4. 82 cents
No. 3. 7, 7, 7, $8\frac{3}{4}$, $6\frac{1}{4}$, $3\frac{1}{2}$. 85 cents
No. 4. $8\frac{1}{2}$, $8\frac{3}{4}$, $8\frac{1}{4}$, $7\frac{3}{4}$, $7\frac{1}{4}$, 4. 77 cents

NOTE. For time over 40 hours wages per hour are $1\frac{1}{2}$ times given rates.

Find out the bills and coins needed for making up the following weekly payrolls:

3.

Randolph Lee	$ 51.73
Gus Hedlund	64.96
Billy Disque	48.37
Mary Boston	42.83
Howard Stahl	61.48
Total	$269.37

4.

Arthur Bask	$ 49.26
Fred George	61.59
Agnes Wilson	33.47
Jack Mason	56.28
Doris Frame	37.57
Total	$238.17

5.

Harry Radford	$ 43.69
Richard Keller	57.29
Susan Kidd	36.84
Abe Fletcher	73.71
Florence Guinnell	54.99
Total	$266.52

Special investigation

6. If possible, secure a real payroll containing not more than 10 employees. Describe its form briefly to the class and post it on the bulletin board. If your father has to make out a payroll, try to get permission to do a trial computation on the number of different bills and coins needed to meet the payroll.

Computing profit and loss.

Many persons think that profit is the difference between selling price and cost price. This is not profit but ***margin.*** To find the profit, we must deduct a host of operating expenses, such as rent of the store, wages of employees, heat, light, water, insurance, taxes, etc. If the margin is larger than the operating expenses, the difference between margin and operating expenses is ***profit.***

However, if the margin is less than the operating expenses, the difference is a ***loss.*** In brief, the difference is a negative number, and the businessman would say that he has gone "in the red."

Profit and loss computations actually involve *signed numbers,* which are numbers indicated by the signs + and −. A plus sign or no sign at all indicates a positive number, thus: 9 or + 9. A minus sign indicates a negative number, thus: − 9. Do not confuse these signs with addition and subtraction signs.

In general, follow these rules:

(1) To find the selling price, add the operating expenses to the cost. Then to this sum add the profit or subtract the loss.

(2) To find the per cent of profit or loss, first find the amount of profit or loss and then find what per cent this is of the selling price.

1. What per cent profit or loss do you make on the following investments? A minus sign is used to show a loss.

	SELLING PRICE	PROFIT OR LOSS
(*a*)	$12	$3
(*b*)	$50	$10
(*c*)	$60	− $20
(*d*)	$70	$3.50
(*e*)	$450	− $150
(*f*)	$72	$2.40
(*g*)	$240	$6
(*h*)	$84	$60
(*i*)	$420	$210
(*j*)	$16	$8
(*k*)	$640	− $80
(*l*)	$36	$9
(*m*)	$60	$2.40

	SELLING PRICE	PROFIT OR LOSS
(*n*)	$25	$1.50
(*o*)	$63	$18
(*p*)	5¢	4¢
(*q*)	$33	− $3
(*r*)	$44	$33
(*s*)	$71	$7.10
(*t*)	$9600	$24
(*u*)	$2	$.80
(*v*)	$28	− $3.50
(*w*)	$500	$400
(*x*)	$35	$7
(*y*)	a quarter	a dime
(*z*)	$64	$48

2. Do you know what each part of this table means? Probably the sample filled out will help you do your part. You are to compute the missing numbers for the blank places. Net profit expressed as per cent is based on selling price. If there is no sign in front of the value in the "Net Profit or Loss Column," the amount is profit; if a minus sign is used, the amount is loss.

SALES	COST OF GOODS	OPERATING EXPENSES	NET PROFIT OR LOSS	NET PROFIT EXPRESSED AS % OF SALES
$1000	$ 600	$250	$150	15%
2400	1775	425	200	
3200	2500	300	400	
5000		500	– 400	– 8
		200	250	10
2500	2000	400		
		600	– 700	– 20
3000	1500		800	

Computing commission.

There are many agents and brokers selling or buying on commission. No doubt you know many men and women who sell automobiles, insurance, stocks, bonds, and real estate. These salesmen usually work on commission; that is, at least a part of their pay is a certain per cent of the amount of money involved in the business deal. The computation of commissions is one of the most widely used applications of per cents.[1]

1. Mr. Allison works in a furniture store. He gets a salary of $40 a week and a commission of 2% on all sales. Last week his sales amounted to $970. What was his total income for the week?

2. Jimmie sells magazines and receives a 30% commission. He wants to earn $30 for Christmas. How many dollars' worth of magazines will he have to sell?

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[1] TO THE TEACHER. If anyone still needs a review of per cents, turn to pages 393–402.

3. An agent sold a second-hand automobile for $480. How much was left for the dealer after the agent deducted a commission of $8\frac{1}{2}$%?

4. My agent collects a debt of $600 for me and I have to pay him $27 as a commission. Express his rate of commission as a per cent.

5. Compute the commission for each of the following: You are to allow 10% commission in Dept. A, $12\frac{1}{2}$% in Dept. B, and $8\frac{1}{3}$% in Dept. C. (Drop fractional parts of a cent.)

JULY 1–31	DEPT. A		DEPT. B		DEPT. C	
	SALES	COM. 10%	SALES	COM. $12\frac{1}{2}$%	SALES	COM. $8\frac{1}{3}$%
John Doe	$427.56		$361.05		$168.24	
A. Walker	$963.21		$692.28		$720.88	
R. M. Bell	$706.50		$210.16		$510.52	
T. Atkins	$212.84		$325.06		$72.28	
Sam Jones	$93.72		$151.83		$127.20	

6. The following is a list of sales made by the various clerks in a certain store. Dept. A allows 5% commission, Dept. B 15%, and Dept. C $16\frac{2}{3}$%. Find the amount of commission in each case. (Drop fractional parts of a cent.)

	DEPT. A SALES	DEPT. B SALES	DEPT. C SALES
(*a*)	$36.28	$9.00	$97.38
(*b*)	$261.95	$207.18	$258.66
(*c*)	$178.36	$516.60	$300.09
(*d*)	$315.76	$256.13	$192.48
(*e*)	$73.26	$702.65	$415.10
(*f*)	$194.82	$439.58	$268.02
(*g*)	$36.26	$51.80	$129.54
(*h*)	$92.79	$61.28	$100.00
(*i*)	$54.61	$500.24	$276.18
(*j*)	$279.17	$128.04	$410.75
(*k*)	$722.18	$817.70	$520.10
(*l*)	$800.00	$48.26	$926.00

Final Test on Unit IV

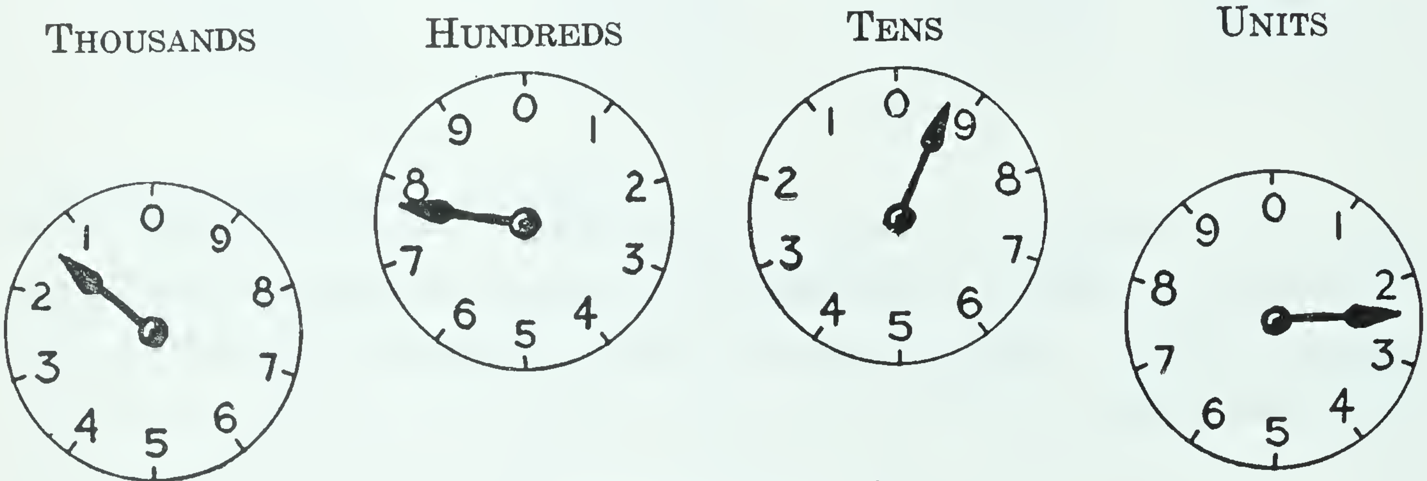
PART I: PROBLEMS

1. The Dixons estimate that their family income for next year will be $3000. They estimate that taxes will take $240, food $1000, shelter $480, clothing $300, and other costs and savings $980. What per cent of the income does each of these amounts represent?

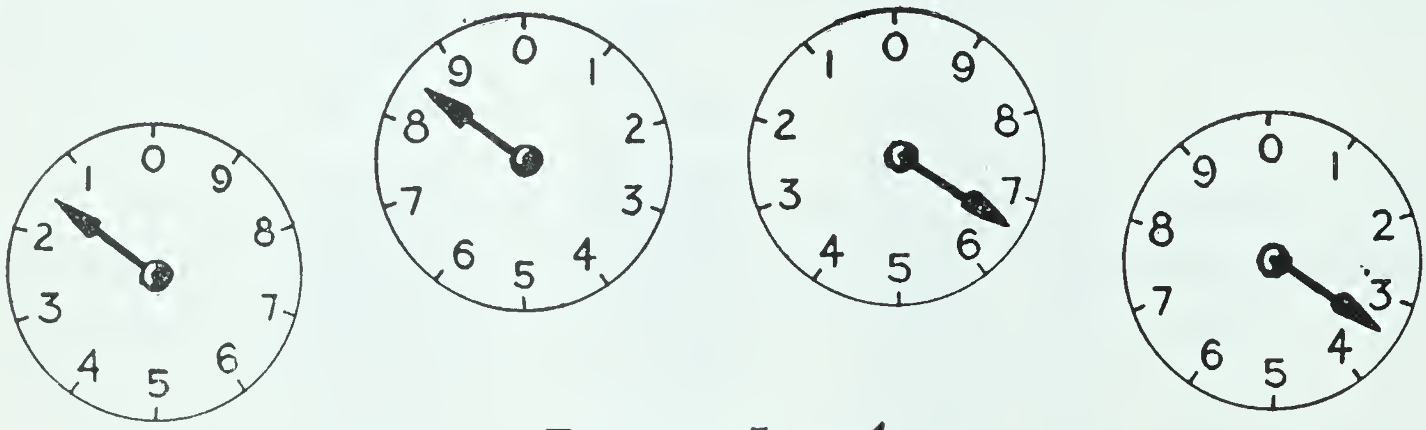
2. In one year the Allisons use 10 tons of coal, each ton of which produces 16.2 million B.T.U. of useful heat. How much fuel oil (whole gallons) would be required to produce the same total amount of useful heat, if one gallon produces 103,500 B.T.U. of useful heat?

3. At 4 cents per kilowatt-hour, how much would it cost to operate a 250-watt washing machine for 10 hours?

4. Mr. Howard's electric meter read as follows:



READING MAY 1



READING JUNE 1

What should be his electricity bill for May at the rate of 8 cents per kilowatt-hour for the first 10 kwh, 5 cents per kwh for the next 40 kwh, and $2\frac{1}{2}$ cents per kwh for all over 50 kwh?

5. A wholesaler allows series discounts of 20%, 10%, and 5% on certain bills. What would be the amount due on a bill of $540 after these discounts had been allowed?

6. George Ricks checked his last bank statement. He found $83.21 in outstanding checks. His checkbook showed a balance of $231.56. He had deposited $75 since the bank made the last statement. If George has made no mistake, he should check with the balance of _?_ shown by the bank statement.

7. Use the fewest possible coins for change from the following purchases: 8 cents, paid with a half dollar; 23 cents, paid with a dollar; 2 dollars 17 cents, paid with 5 dollars.

8. During one week Henry Morton worked $3\frac{1}{2}$, $2\frac{1}{2}$, $3\frac{1}{2}$, 3, and 2 hours after school, and 8 hours on Saturday. What amount should be entered in the "Total Wage" column of the weekly payroll if his wages per hour were 75 cents? (Drop fractional parts of a cent.)

9. On sales amounting to $15,000 the original cost was $10,000 and the operating expense was $2000. What per cent of profit was made on the sales?

10. Ann Henley's sales last week amounted to $36.80 on Monday, $82.51 on Tuesday, $43.21 on Wednesday, $50.91 on Thursday, $61.28 on Friday, and $108.29 on Saturday. How much commission did she get at a rate of 2%?

PART II: MAKING A BUDGET

11. Assume you have finished school and have your first job. Your yearly income is $1436 (over and above taxes withheld and social security). Prepare a budget for yourself based on this amount. Assume that you do not live at home and therefore must provide for everything, including shelter and food.

TESTS ON PER CENTS

Inventory Test 11: Fractions, Decimals, and Per Cents

Time, 4 minutes. Write each of the following as per cent:

SAMPLE: $\frac{1}{5} = \underline{\ ?\ }$ (You should write $\frac{1}{5} = 20\%$.)

1. $\frac{3}{100} = \underline{\ ?\ }$
2. $\frac{3}{5} = \underline{\ ?\ }$
3. $\frac{5}{8} = \underline{\ ?\ }$
4. $.75 = \underline{\ ?\ }$
5. $.075 = \underline{\ ?\ }$
6. $\frac{4}{5} = \underline{\ ?\ }$
7. $\frac{1}{3} = \underline{\ ?\ }$
8. $\frac{3}{8} = \underline{\ ?\ }$
9. $.2 = \underline{\ ?\ }$
10. $0.875 = \underline{\ ?\ }$

Write each of the following as a decimal fraction:

11. $\frac{3}{10} = \underline{\ ?\ }$
12. $\frac{1}{4} = \underline{\ ?\ }$
13. $\frac{2}{5} = \underline{\ ?\ }$
14. $6\% = \underline{\ ?\ }$
15. $\frac{3}{5} = \underline{\ ?\ }$
16. $\frac{1}{8} = \underline{\ ?\ }$
17. $7\frac{1}{2}\% = \underline{\ ?\ }$
18. $\frac{7}{100} = \underline{\ ?\ }$
19. $12\frac{1}{2}\% = \underline{\ ?\ }$
20. $37\frac{1}{2}\% = \underline{\ ?\ }$

Write each of the following as a common fraction:

21. $20\% = \underline{\ ?\ }$
22. $9\% = \underline{\ ?\ }$
23. $25\% = \underline{\ ?\ }$
24. $12\frac{1}{2}\% = \underline{\ ?\ }$
25. $33\frac{1}{3}\% = \underline{\ ?\ }$

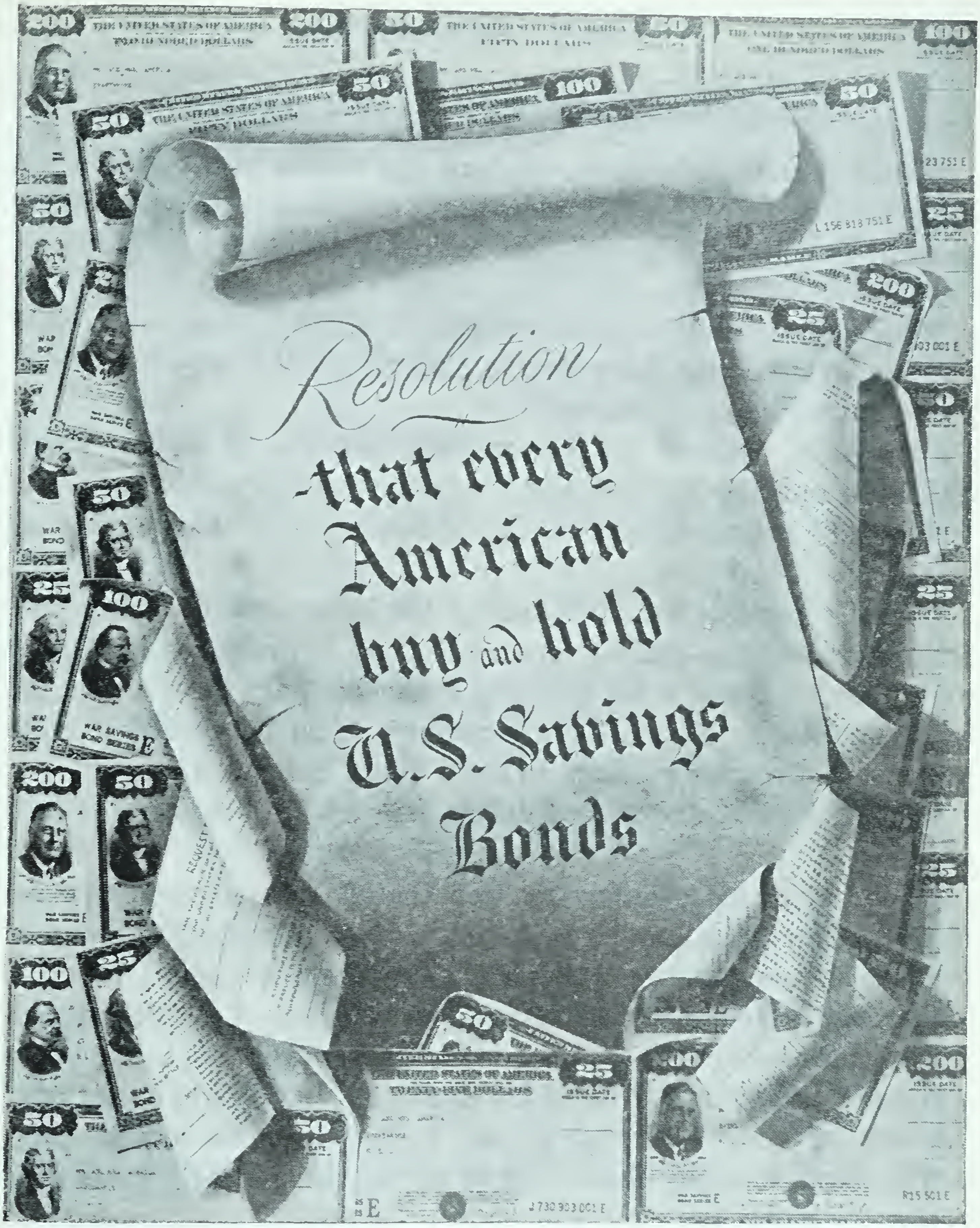
Answers on page 424. If you had more than one error, you should *study* pages 394–402 and take Practice Tests 11 A and 11 B on page 419.

Inventory Test 12: Recognizing Equivalents

Copy only the correct numbers in parentheses and *no others.*

1. 60% equals ($\frac{60}{100}$, $\frac{3}{5}$, .060, 0.6)
2. $37\frac{1}{2}\%$ equals ($\frac{3}{8}$, $\frac{1}{3}$, .375, $\frac{375}{1000}$)
3. 75% equals ($.7\frac{1}{2}$, $\frac{75}{1000}$, .75, $\frac{7.5}{10}$)
4. $6\frac{1}{4}\%$ equals ($\frac{1}{6}$, $0.062\frac{1}{2}$, $.06\frac{1}{4}$, .07)
5. 30% equals (0.3, $\frac{300}{1000}$, .30, $\frac{30}{100}$)
6. $\frac{7}{8}$ equals ($\frac{87.5}{100}$, $\frac{4}{5}$, $.87\frac{1}{2}$, $\frac{875}{1000}$)
7. $\frac{1}{12}$ equals ($\frac{2}{24}$, .08, .07, $8\frac{1}{3}\%$)
8. $\frac{1}{5}$ is (greater than .25, less than $\frac{1}{4}$, greater than $\frac{1}{6}$)
9. $\frac{2}{5}$ equals (.04, $\frac{4}{8}$, $\frac{40}{100}$, 4%)
10. $\frac{1}{6}$ equals ($16\frac{2}{3}\%$, greater than .17)

Answers on page 424. If you had more than one error, you should *study* pages 394–402 and take Practice Test 12 A on page 420.


Resolution
-that every American buy and hold U.S. Savings Bonds

U. S. Treasury Department

UNIT V

Investments

Invested Savings Earn Money

The story is told of a day in the long ago when a poor man of Syria called his sons before him for a few words of advice. He spoke slowly and in a deep, resonant voice as he addressed his sons.

"You know that my brother, your Uncle Habib, is a rich man. His children, your cousins, have lived in plenty while you have had to live simply on my meager earnings."

"We know, Father," the boys replied, "but it is no fault of yours. You have done the best you could. An unfair fate has favored Uncle Habib and has been unkind to you, for surely you are as wise as your brother."

"What you say is but a half-truth," the father replied. "It is true that, when we were children, our teacher did not consider your uncle my superior. But it is not true that I have done the best I could; no cruel fate can be blamed for my poverty. And it is for this latter reason that I counsel you now to learn from our two examples."

"Speak, Father, and we will follow your advice," each of the boys promised.

"Your Uncle Habib early realized that it takes money to make money. The capital necessary to put his theory in practice he saved from his meager earnings, which at the start were no larger than mine. He planned his affairs so that he could put aside a part of all he earned. This was not a large part at first, when his earnings were small, but it was never less than a tenth of his earnings. But I didn't see things his way. I always believed I had worked hard for my earnings and deserved to enjoy them. I told my brother he could never save enough to make him rich, and besides, he might invest his savings unwisely and lose them all."

"Do you believe we can become wealthy like Uncle Habib if we are thrifty and save as much as a tenth of our earnings?" one of the boys asked his father.

"No, my son," the old man replied. "Your uncle has been far wiser. He has known not only the value of saving, but he has made his savings work for him. At first he made a serious mistake which made me feel that my plan was the better. In fact, I laughed at his misfortune and chided him for his foolishness. When he had saved for several years, he entrusted his savings to a close friend, Amin, the shoemaker. Amin was going into a far country where he would buy rare ivory carvings. He would buy them cheaply from the natives and sell them dearly upon his return to Syria. Your uncle received the carvings from Amin, but he soon discovered that they were made of wood and could not be sold at any price. All of Habib's savings were lost because he had entrusted his money to a man who was inexperienced in making investments."

"How did Uncle Habib ever manage to become wealthy after this misfortune?" another son asked.

"He started saving once more, but he was more careful about those to whom he entrusted his savings. I have watched your uncle's progress through the years and his success cannot be explained by magic. Every year he has —

Saved a part of all he earned.

Made his savings servants to work for him.

Made his earnings from his earnings more servants to work for him.

Entrusted his savings only to those who have a record of honesty and efficiency in investing other people's savings.

"And so, my sons, I say to you now in my old age that, if you would obtain in this life the comforts which you desire, you must do likewise."

Thus ended the counsel of the poor man of Syria, who lived in the long ago. Do you think the rich brother's plan would work today? Thrift and wise investments, of course, are making men wealthy today as they have throughout the ages. Only now it is extremely difficult to select investments that are safe and are likely to produce a stable income. Do you know that of the men who have personally determined where or with whom to invest their own money only 5% have retained even as much as the original principal when they reached 65? Nevertheless, some investments are both honest and reliable. Moreover, as you will see in this unit, careful investments of time and mind as well as financial investments may yield large returns.

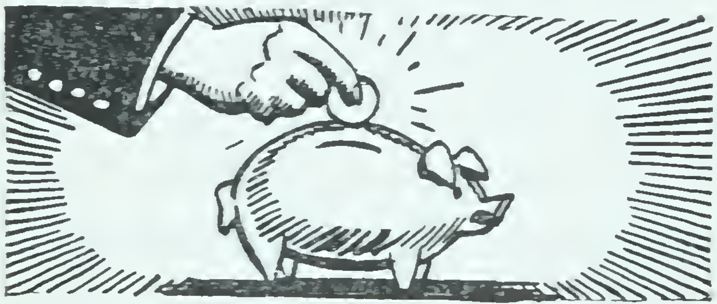
PROBLEM I

What Is a Good Investment?

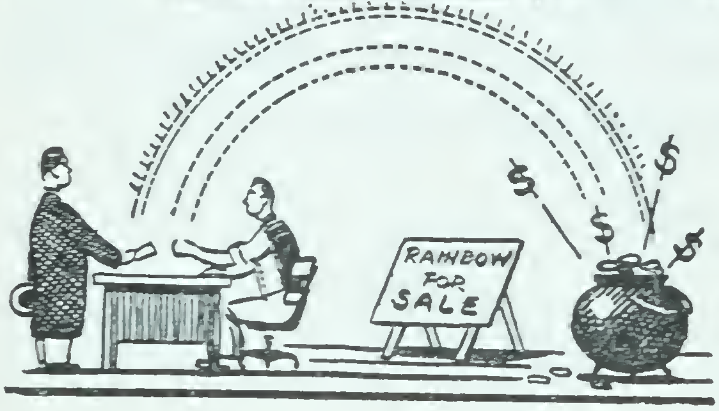
You have probably heard stories about persons who invested small sums of money in some enterprise, which later made them wealthy. Success stories are always interesting, and authors have waxed eloquent for many years on the glamour of attaining quick wealth through clever investments or by means of bright ideas turned into the manufacture of simple but useful devices for greater comfort or convenience. Perhaps you know a man who bought a farm on which oil was afterward discovered. Or you may have read about the man who invested all he had in a small machine shop; how the shop developed into a large automobile plant; and how Mr. Wise Investor became a man of wealth.

Why can't the average citizen do these things? Why is it that the average person who tries to make paying investments often loses all he has? Probably because too many are dazzled by a get-rich-quick formula for making investments. In general, John Q. Citizen is unwilling to accept small returns even though they are reasonable and regular. Patience is required. More often than not a man of means has accumulated his wealth over a lifetime. He has found that good judgment is an essential; and mentally, at least, he has followed a set of guides similar to those listed here.

Guides for investors.

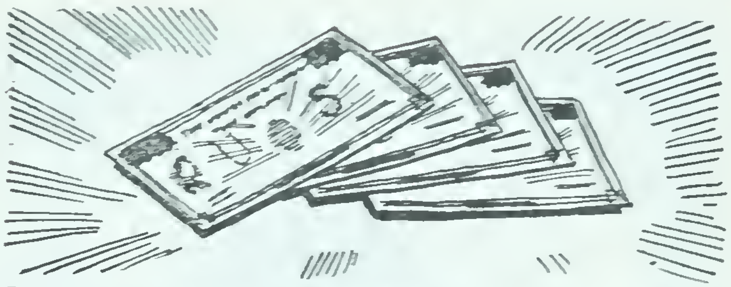


Security of principal. Can you be reasonably certain that you will get back at least as much money as you put in?



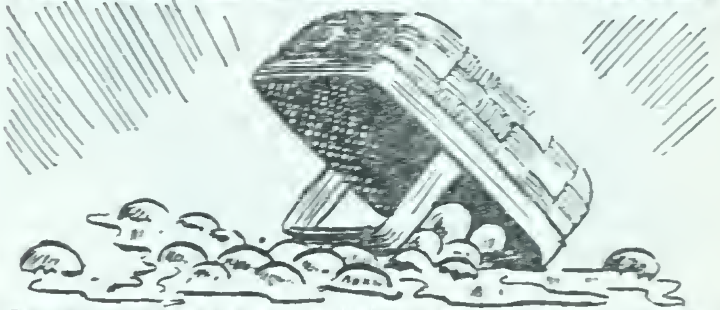
Investment vs. *speculation.* An investor seeks a normal rate of interest on his investment. A speculator seeks a large return at a greater risk. The speculator frequently loses his entire investment.

Certainty of income. Is your investment likely to yield an income even in a severe business depression?



Marketability. Can you sell your investment at any time if you want to or need to?

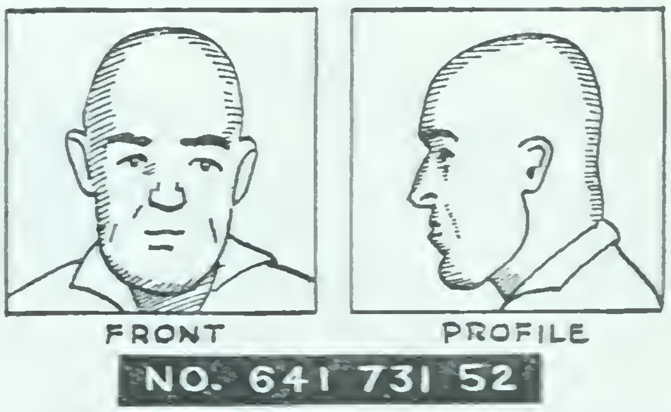
Diversity. In general, it is good judgment to invest in several kinds of good securities so that a single failure will not mean complete disaster.



Infrequent reinvestment. How often will your investment mature so that you will have the trouble of finding a new and safe place to put your capital? The average person engaged in making a living has little time to give to recurring investment problems.

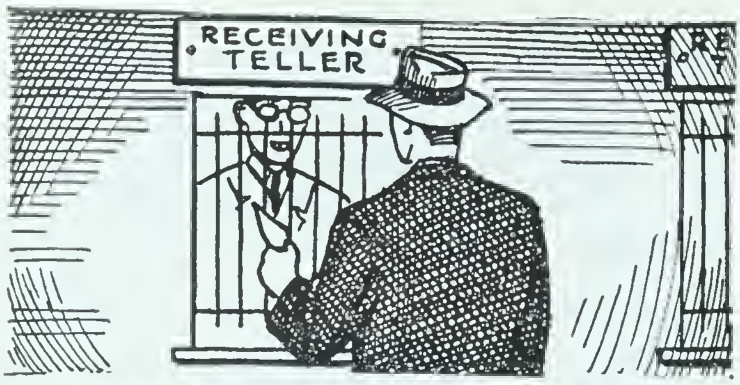
STOCK
BONDS
BANK

Character and reliability of management. Brokers' offices have much available information concerning persons who manage large businesses with whom you might invest money. This information is essential for the careful investor.

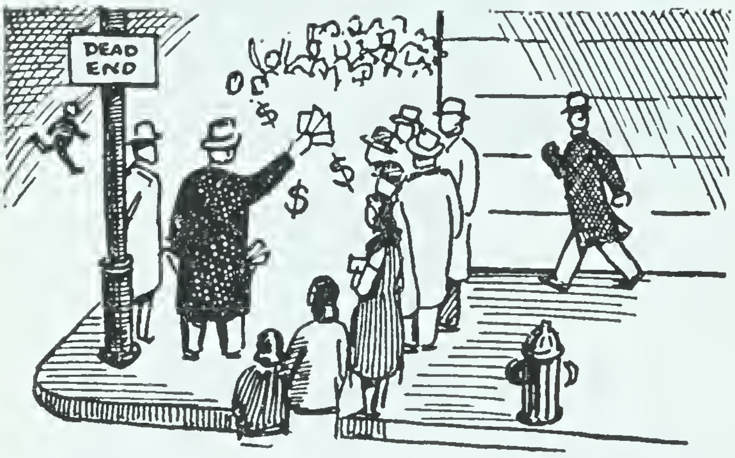


Small risks at first. Experience can be secured as well with $100 as with $1000; and mistakes are not so costly.

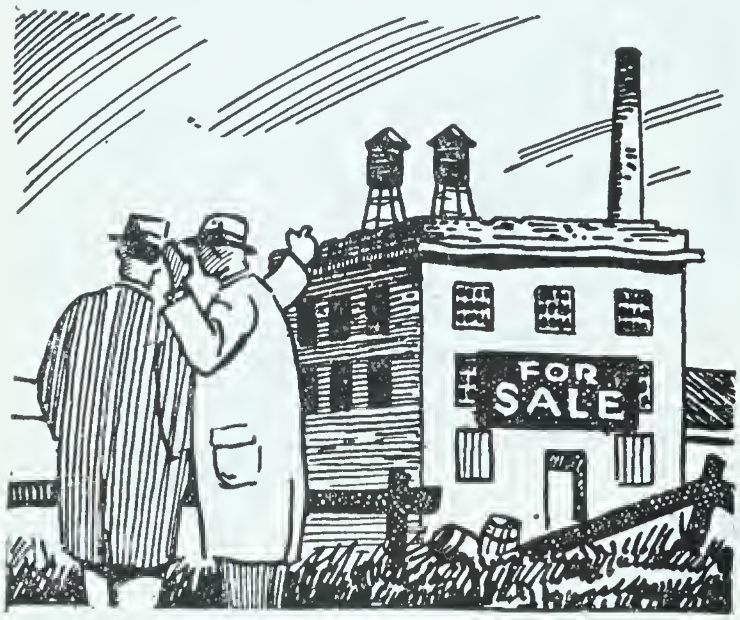
LIFE GUARD
LEARN TO SWIM IN SHALLOW WATER



Invest only your surplus or savings. In general, a safe policy is to invest only what you have accumulated in excess of current expenses. Do not invest money needed for daily living.



Keep your business to yourself. The person who lets it be known that he has money to invest will never be lonely. He invites swindlers and schemers to separate him from his money.



Think twice before following a friendly tip. Usually, a good friend is afraid to give you investment advice. He is afraid he might be wrong. The man who is capable of advising offers this information only professionally as a financial adviser in a reputable institution.

Always keep a fund in reserve. Emergencies will always arise requiring ready cash. For such emergencies you should always hold out a reserve fund that is not less than $\frac{1}{5}$ of your annual income. If you have to sell some of your investments to raise ready cash, you may have to sacrifice not only part of the principal but also your future income.

Questions to Discuss and Things to Do

1. Examine your daily paper, particularly the Sunday edition, and select one investment opportunity that you would rate as good when evaluating it by these standards. Also select one that you would rate as either poor or extremely speculative. Explain your choices.

2. The *Reader's Digest* once awarded $25,000 in prizes for ideas of how new businesses could be started and reports on ideas that had been successfully used. Here are some of the ideas: (*a*) One person made bread from home-ground wheat flour and sold it to the local grocers; the business has grown, until at the present time 125 persons are employed. (*b*) A carpenter designed and manufactured a combination stepladder, ironing board, and kitchen chair; in the first year 28,000 were sold. Can you report any similar investments of ideas?

3. John and Henry Porter are brothers. After John was graduated from high school, he worked one year. Then he went to college and four years later was graduated with a degree in engineering. To pay his college expenses, he borrowed some money and worked for the remainder. Three years after he left college, he paid back the money he had borrowed. He was now even with the world and had a good job with an engineering organization.

Henry went to work as soon as he finished high school. He saved enough to buy and pay for a home in eight years.

Compare the investments these two boys made in the eight years after leaving high school. What other information would you need before you could say which made the wiser investment?

4. Mr. Lee Flippen is a wealthy man who has helped many young persons get started in business. Recently, two local girls, who were high school graduates, asked him to lend them money to start beauty parlors. Mr. Flippen asked the girls how much they had of their own to put in a new business. Grace Mason said she had saved $125 by working in a ten-cent store. Mary Andrews said she had no money to put in a business, but that she had taken a course in beauty culture while in high school and since graduation had worked in a beauty parlor. She had used her savings to pay for night school courses in business administration. Mr. Flippen lent Mary money but turned down Grace. Do you think he was right? Why?

Below are descriptions of investments that may exist in your community. As you read each description, recall the preceding list of guides and give the investment a rating. Call the investment *good* if you think there are more reasons for it to succeed than to fail; call it *fair* if you think the chances of failing or of succeeding are about equal; and call it *poor* if you think it is more likely to fail than to succeed.

5. Jack Harper has bought two building lots in a section just beyond the city limits, where some city people are beginning to build. City residential lots of the size Jack bought are scarce and sell for around $3000. He paid $500 apiece for his lots. He thinks the population in the section will soon grow to such an extent that the lots will be worth practically as much as city lots.

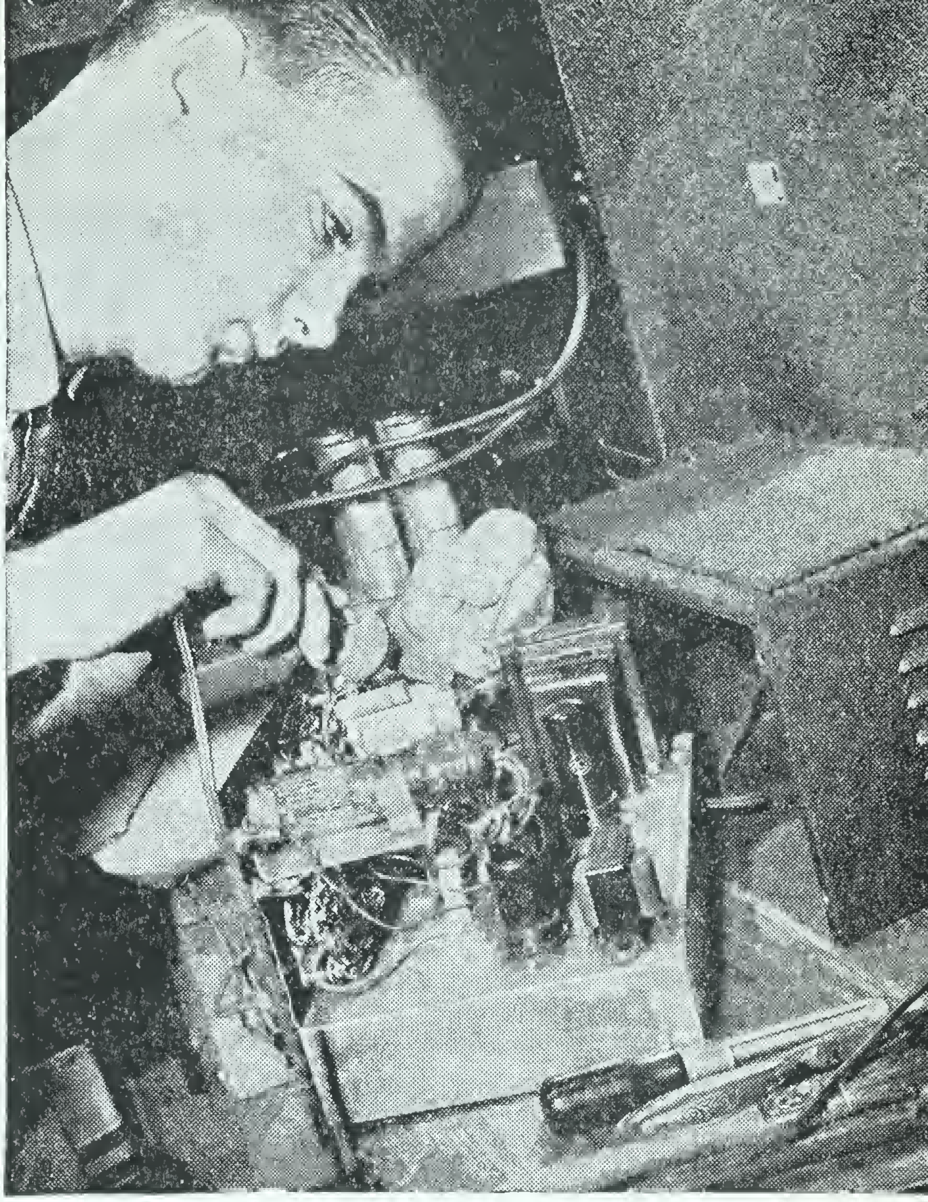
6. Mrs. Linton's husband was a doctor with an extensive practice. He had his office in a small downtown building. When he died, many young doctors from other towns tried to rent his office. Because of the number of doctors interested, Mrs. Linton decided to invest most of her husband's life insurance money to provide more doctors' offices. At considerable expense she enlarged and modernized a local building so as to provide ten office suites to rent to doctors.

7. Because of the large number of employees required by the new television plant in Piedmont, a housing shortage has developed. Mr. Albert Brooks, a well-to-do real-estate man, is building a large apartment building near the plant. Even though the building is not yet completed, he has already rented all the apartments at prevailing rates.

8. Alice Marsh has been working in a beauty parlor for several years. She has managed to save $500. Recently her employer offered her a one-third interest in the business for $500. Alice invested her $500, which was used for new equipment and additions to the parlor. Two more girls were hired to help handle the expanding business.

9. A new highway has just been built near Bill Curry's home. It crosses the old highway just beyond Bill's house. Bill thinks this intersection a good place to have a filling station. He decides to use his savings and to borrow enough more to build an attractive filling station with modern equipment for servicing automobiles.

This is John Michener, who expects to work in electronics research. He uses his own basement laboratory to conduct experiments. Here he is soldering a connection on a homemade Wein bridge for testing purposes.



Westinghouse Electric and Manufacturing Company

PROBLEM II

How Are Stocks Bought and Sold?

Charlie Phillips and George Walsh are two enterprising high school students. For several years Charlie has spent his spare time tinkering with radios and making a few dollars on repairs. George has picked up odd dollars repairing golf clubs and stringing tennis rackets for the "Pro" at the club. More recently, persons began to ask Charlie's advice about buying new radios and to consult George about new sporting equipment. Friends advised Charlie and George to open a store to sell and repair radios and sporting goods.

The boys thought well of these suggestions, but they hadn't enough money to start a store. One day a pal suggested that they form a *corporation* and let the members of their class in high school help to finance the organization. When enthusiasm over this plan ran high, Charlie and George decided to consult Mr. Walker at the Meadowbrook Bank about their problem. Charlie and George explained the situation to Mr. Walker as best they could. Here is a part of the conversation which followed their explanation.

Mr. Walker: It is possible for you to form a corporation and to sell *shares* in the organization. There are certain legal procedures involved, and you will need to consult a good lawyer. However, here is a rough outline of the way your organization is established.

You carefully estimate how much *capital* you will need to establish your store and to keep it running for a reasonable period of time. Under favorable circumstances you can borrow some of this money from a bank and the rest can be obtained by selling stock to your classmates.

George: What do you mean by selling stock?

Mr. Walker: When you sell stock to your classmates, you are allowing them to buy a part of your business. Each unit that a student buys is called a ***share.*** When a student buys one or more shares he becomes a ***stockholder,*** and your organization must give him or her a certificate showing such part ownership. Your stock may or may not have a ***face value*** or ***par value,*** but if it does, this value is stated on the stock certificate.

Charlie: What good is this certificate that the stockholder gets?

Mr. Walker: The stock certificate is the buyer's proof that he is a part owner. As part owner he is entitled to his share of any profits that may be distributed (quarterly, semiannually, or annually). For example, suppose your business sells 100 shares of stock with a par value of $25 a share. At the end of a year the books of the organization show that after all operating expenses (wages, salaries, rentals, etc.), interest on bank loans, and taxes have been paid, there will be a certain amount of money left over. The board of directors of your organization then meet and decide how much of this surplus should be put aside for future needs. They also decide how much, if any, of this surplus should be distributed to the stockholders.

When the directors of the corporation decide to distribute some of the profits to the stockholders, the corporation is said to declare a ***dividend.*** Assume that the directors decide to declare a dividend of $200. This amount must be divided equally among the 100 shares of stock. Each share will have earned $2. And for each share that a stockholder has, he will receive $2.

George: But $2 isn't very much to earn for a whole year.

Mr. Walker: On the contrary, it is a great deal. Do you realize that a $2 return on each 25-dollar share represents $8 interest on every $100 invested? That is an exceptionally high rate and cannot be realized in most businesses today.

Charlie and George: Thank you, Mr. Walker, for your time and for your help. We shall certainly look further into this idea, and we may be back to your bank for a loan in the near future.

There are different kinds of stock and dividends.

The plan of selling stock is widely used to obtain capital for either starting a new business or remodeling and expanding an old one. General Motors and United States Steel are examples of very large stock companies. Can you name some others? Are there any stock companies in your community?

Many corporations, especially the larger ones, sell two kinds of stock, ***preferred*** and ***common.*** A share of preferred stock generally costs more than one of common stock. If a dividend is declared, the holders of preferred stock are paid first. And it is quite possible that a dividend will be declared for preferred stock only. Also, a preferred stock has a fixed rate of dividend (as 4, $4\frac{1}{2}$, or 5% of the par value), and the holder of preferred stock cannot receive more than the stipulated rate on his certificate. However, if the declared dividend is large, the holder of common stock will receive his proportionate amount, which may be as high as 10% of the par value of his stock. But — and this is important — there is *never* any guarantee that a stockholder, either of preferred or of common, will receive a dividend.

Here's an example of what might happen. A corporation has outstanding 16,000 shares of common stock with a par value of $25 a share (total value, $400,000), and 1000 shares of 6% preferred stock with a par value of $100 a share (total value, $100,000). At the end of a year the board of directors declares a dividend of $36,000. The holders of preferred stock will then receive 6% of $100,000, or $6000, of this amount, and the holders of common stock will receive $30,000. The rate of interest on the common stock for this particular year is $30{,}000 \div 400{,}000 = .07\frac{1}{2}$, or $7\frac{1}{2}\%$.

Questions to Discuss and Things to Do

1. Mr. Allen owns 25 shares of preferred stock valued at $100 a share. The dividend rate specified for this stock is 5%. Each year that the company pays the full dividend on this preferred stock, Mr. Allen gets $_?_.

2. In one year Mr. Hart received $1 a share in dividends on his common stock. He paid $20 a share for it. The rate of interest on his investment was _?_%.

3. The Valley Fertilizer Corporation has issued 15,000 shares of preferred stock valued at $100 a share and 50,000 shares of common stock valued at $25 a share. The total value of the outstanding stock is $_?_.

4. Full dividends on the 1.5 million dollars of preferred stock in Exercise 3 at 6% would amount to $_?_. If the company distributes $140,000 in dividends, $_?_ will go to the common stockholders.

5. If $60,000 is distributed to the stockholders holding 50,000 shares of common stock, what is the dividend per share? How much will a stockholder get who owns 200 shares?

6. Mr. Bank is a director of the Central Tire and Rubber Company. He owns 20% of the 6% preferred stock and 30% of the common stock. The company has 30,000 shares of preferred stock with a par value of $50 a share and 120,000 shares of common stock with a par value of $15 a share. What is the par value of Mr. Bank's investment?

7. The common stock of the United Paint Products Corporation is selling for $20 a share. It regularly pays $1.40 a share in dividends. This is what per cent of the investment? Would it be better to have 6% preferred stock at $100 a share?

8. The Dan River Textile Company is converting its 50,000 shares of preferred stock to common in the ratio of four shares of common for one preferred. The par value of the preferred stock is $100 and the dividend rate is 6%. This means that the company no longer must pay a dividend of _?_ on preferred stock before it can pay dividends on common stock.

Special investigations *

9. Find out how many shares of common and preferred stock have been issued by some local corporation, such as your local bank. Then investigate the corporation's dividend history. Report your findings to the class.

10. For each of five large corporations in America report (*a*) the number of shares of common stock and (*b*) the number of shares of preferred stock. (*c*) Now find the current price quotations on each of these stocks and multiply by the number of shares. This will give you a rough idea of the capital worth of each company.

11. Prepare a report on the place of the large corporation in the American scene, covering such points as the following:

(*a*) What are the advantages of size?

(*b*) How has control of large business organizations shifted in recent years? How has the relation of the individual stockholder changed?

(*c*) In whose interests should a large business organization be operated: the stockholder? labor? the executives? the consuming public? society?

Many thousand shares of stock are sold daily.

When stocks are sold, the price per share is seldom the same as the par value. If the company is prospering and paying large dividends, the stock will probably sell above par. If the company's business is not thriving or if its record of dividends is poor, the stock is likely to sell considerably below par. But there are many and involved social, financial, and political factors which affect the selling price of stock.

A stockholder, who so desires, may sell his shares just as he may sell any other property, for when he sells his stock he is merely selling the part of the corporation which he owns. The amount of money he receives per share may be more or less than he invested, depending on the market values of the stock at the two different times.

The New York Stock Exchange and the New York Curb Exchange are two large markets in New York City where stocks are bought and sold. Tied in with these central markets are smaller markets in the larger cities throughout the country. These smaller markets are for your convenience. If you want to buy one or more shares of a stock, all you need to do is to telephone your local stockbroker. You tell him quite informally how many shares you want, and perhaps you fix a maximum price. It is as simple as that. Your broker may buy the shares by teletype message or by telegram. You receive a bill for the cost, and a few days later you receive the stock certificate.

Selling is equally simple. You wish to sell 10 shares of your General Motors stock. You telephone your broker, saying, "Sell 10 shares of General Motors at market price." If trading is slow, you may add some condition such as, "Sell but not for less than one dollar under market price." The broker sells your shares by communicating with the Stock Exchange. A few days later you receive your check as you turn over to him the stock certificates for the shares that he sold.

The selling price of stocks is expressed in terms of dollars and fractions of a dollar rather than dollars and cents. The fractions are usually $\frac{1}{2}$'s, $\frac{1}{4}$'s, or $\frac{1}{8}$'s. Thus a share of stock may sell for $41\frac{1}{8}$, $41\frac{1}{4}$, $41\frac{3}{8}$, $41\frac{1}{2}$, $41\frac{5}{8}$, $41\frac{3}{4}$, $41\frac{7}{8}$, or 42. Of course, when a share sells for $41\frac{1}{4}$ this means that the price of each share is $41.25.

Problems to Solve

1. What would be the total cost of the following shares of stock at the prices given? (Neglect fees and taxes.)

(*a*) 20 shares U. S. Steel at $41\frac{3}{4}$
(*b*) 32 shares General Motors at $54\frac{7}{8}$
(*c*) 120 shares Radio Corporation of America at $20\frac{1}{2}$
(*d*) 150 shares United Gas Improvement at $27\frac{1}{4}$
(*e*) 80 shares Douglass Aircraft at $50\frac{1}{8}$

2. How much would a person receive in dividends on the following preferred stocks at the rates given (par value of $100)?

(*a*) 40 shares International Nickel at 7%
(*b*) 124 shares Radio Corporation at $3\frac{1}{2}$%
(*c*) 50 shares U. S. Steel at 7%
(*d*) 75 shares Southern Railway at 5%
(*e*) 90 shares International Harvester at 7%

Stockbrokers charge commissions for buying and selling stocks

Stocks are usually bought or sold in *units* of 100 shares through a broker. For his services he charges a commission, known as ***brokerage.*** The broker charges a commission whether he is buying or selling stock. The charges are made according to the following rates:

MONEY VALUE OF SALE OR PURCHASE	COMMISSION
First \$100	6%
\$100 to 999.99	1% + \$5.00
\$1000 to 3,999.99	$\frac{1}{2}$% + \$10.00
\$4000 and above	$\frac{1}{10}$% + \$26.00
Odd lots[1]	above rates less 10%

Let us try these rates on the following sales:

1. 1 unit of 100 shares Gen. Atom at $\frac{3}{4}$
Money value equals 100 × \$0.75 = \$75.
6% of \$75 = ?.
Commission = ?.

2. 6 units King Gold Mining at $1\frac{3}{8}$
Money value equals 600 × 1.375 = ?.
Commission = 1% of \$825 + \$5.00 = ?.

3. 6 units U. S. Steel at $43\frac{7}{8}$
Money value equals 600 × \$43.875 = ?.
Commission = $\frac{1}{10}$% of ? + \$26.00 = ?.

4. 3 units Standard Dredging at $5\frac{1}{8}$
Money value equals ?.
Commission = $\frac{1}{2}$% of ? + \$10 = ?.

5. An odd lot transaction of 60 shares of stock at $89\frac{7}{8}$
Money value equals 60 × \$89.875 = \$5392.50.
$\frac{1}{10}$% of \$5392.50 = ?.
\$5.39 + \$26.00 = \$31.39.
10% of \$31.39 = ?.
Commission = \$31.39 − \$3.14 = ?.

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[1] TO THE TEACHER. If a unit of trading is 100 shares and the number of shares in a transaction is for less than 100 shares, the transaction consists of an *odd lot.*

Problems to Solve

1. Find the broker's commission (to next larger whole cent) on each of the following transactions:

(*a*) 10 units U. S. Rubber bought at $72\frac{3}{8}$
(*b*) 6 units United Aircraft sold at $32\frac{3}{8}$
(*c*) 3 units Greyhound Corporation sold at $11\frac{1}{2}$
(*d*) 120 units Consolidated Edison at $31\frac{5}{8}$
(*e*) Odd lot of 75 shares Bethlehem Steel at $55\frac{1}{2}$
(*f*) 9 units Carrier Corp. at $36\frac{1}{2}$
(*g*) Odd lot of 45 shares Int. Tel. at $19\frac{1}{4}$

2. Mr. Bell bought 3 units of Bethlehem Steel at $53\frac{1}{8}$; 5 units of American Tobacco at $63\frac{1}{2}$; 15 units of United Gas Improvement at 29; and 3 units of Radio Corporation of America at $20\frac{1}{4}$. How much did these purchases cost him, including broker's commission?

Taxes on the sale of stocks add to the cost.

Besides the broker's commission, taxes add another charge to the *sale* of stocks. The Federal government taxes the sale of stocks. Moreover, for all sales on the New York markets the state of New York imposes an additional tax. The rates of these taxes are given in this table.

SELLING PRICE PER SHARE	NEW YORK TAX PER SHARE REGARDLESS OF PAR VALUE	FEDERAL TAX PER $100 OF PAR VALUE OR FRACTION; OR PER SHARE FOR NO PAR VALUE
Under $5	1¢	5¢
$5 but under $10	2¢	5¢
$10 but under $20	3¢	5¢
Above $20	4¢	6¢

There is also a Security and Exchange Commission registration fee for sales of stock (none for purchase). This is 1 cent for each $500 market value or fraction thereof. Let's see how the tax works:

(1) Mr. Tyler sold 3 units of stock with no par value for $19 a share. How much did he pay in taxes?

Since the selling price here is less than $20 a share and there is no par value, the 5-cent Federal tax and 3-cent New York State tax on each share will apply. The combined tax rate, then, is 8 cents. Therefore, the total tax on 300 shares is __?__.

(2) Mr. Tyler sold 7 units of stock with a par value of $50 a share for $38 a share. How much did he pay in taxes? What was the registration fee?

Since the selling price here is more than $20 a share and there is a par value, these rates will be used: Federal tax 6 cents for each $100 par value or fraction thereof, and New York tax 4 cents per share.

Total par value is $50 × 700 = $35,000.

Therefore, the total tax which Mr. Tyler pays on the sale is:

$$\begin{aligned} \text{Federal tax } .06 \times 350 &= \$21.00 \\ \text{New York tax } .04 \times 700 &= \underline{\$28.00} \\ \text{Total} &= \$49.00 \end{aligned}$$

Market value of stock is $38 × 700 = $27,600.

Registration fee on $27,600 is $\frac{27600}{500} = 55.2¢$ or 56¢

Problems to Solve

Assume all sales were made at one of the New York exchanges.

1. Find the total tax on each of these sales of stock (no par value):

(*a*) 2 units at $10\frac{1}{4}$
(*b*) 38 units at $23\frac{1}{8}$
(*c*) 50 units at $72\frac{1}{2}$
(*d*) 125 units at 5
(*e*) 75 units at $42\frac{7}{8}$
(*f*) 50 units at $17\frac{1}{2}$

2. Find the total tax and the registration fee on each of the following sales of stock with the par values given:

(*a*) 15 units with par value of $100 a share sold at 53
(*b*) 25 units with par value of $100 a share sold at $72\frac{1}{2}$
(*c*) 30 units with par value of $50 a share sold at $56\frac{1}{4}$
(*d*) 70 units with par value of $50 a share sold at $38\frac{1}{8}$
(*e*) 75 units with par value of $25 a share sold at $18\frac{3}{4}$
(*f*) 125 units with par value of $25 a share sold at $10\frac{1}{4}$
(*g*) 11 units with par value of $70 a share sold at $46\frac{7}{8}$

APPALACHIAN
POWER
COMPANY

Philip Gendreau

Ordinarily this man would keep his bonds in orderly condition in his safe deposit box, but he has spread them out for you to see.

PROBLEM III

How Are Bonds Bought and Sold?

The Rockridge School District needed $200,000 to build a new school building. The people of the school district voted to authorize the school board to issue and to sell *bonds* to raise the money. In other words, the school board was authorized to borrow $200,000 from such persons as might buy the bonds.

The board sold 200 bonds at $1000 each. On each bond it is stated that $2\frac{1}{2}\%$ interest will be paid annually and that the *face value* of the bond will be paid a certain number of years hence. (In this illustration, 10 bonds must be paid off the first year, 10 more the second year, and so on until the last 10 are paid off at the end of the twentieth year.)

How much interest will be paid on one bond for a year? on one bond for the 20 years? How much interest will be paid on the 200 bonds for one year? How much total interest will be paid at the end of 20 years?

The school board decided to set aside from the general school funds each year $\frac{1}{20}$ of the face value of the 200 bonds plus the amount necessary to pay the interest. According to this plan the board will be able to pay off the bonds as they come due.

How much must be taken from the general school fund the first year to meet this bonded indebtedness? how much the twentieth year?

How bonds are issued and called.

Business corporations as well as the local, state, and Federal governments sell bonds to raise money. In every case a bond is a certificate much like a promissory note issued for money borrowed, to be paid back with fixed interest, at some specified time.

Usually bonds are issued at a face value of $1000 each. (Government Savings Bonds are exceptions.) The interest rate on the bond and the period of time before the face value will be returned to the lender are specified at the time the money is borrowed. Some bonds are *callable* before the maturity date. That is, the corporation or government that borrowed the money may decide to pay it back before it is due. This enables the borrower to take advantage of new and lower interest rates. Suppose, for example, that a corporation has outstanding bonds on which it is paying $4\frac{1}{2}\%$ interest and that, because of changed business conditions, it can now borrow money for $3\frac{1}{2}\%$ interest. The corporation will very likely call in the $4\frac{1}{2}\%$ bonds and pay them off with money raised from the sale of the new bonds at $3\frac{1}{2}\%$.

Bonds are of two general kinds, mortgage and debenture (dė·bĕn′tůr). When a bond represents a loan against existing property, it is called a ***mortgage bond.*** On the other hand, when no property is pledged to assure the payment of the bond, it is called a ***debenture bond.*** Debenture bonds are commonly sold by railroads, utility companies, and county, city, or state governments.

Prices of bonds do not change so rapidly or so much as do prices of stocks. Can you think of some condition that might cause the price of a bond to go up? What conditions may cause the price to drop?

Interest on bonds must be paid before dividends are declared on any stock. Moreover, if the company should fail, any assets that are left are used to pay off bondholders before stockholders get anything. Therefore, bonds are ordinarily considered safer investments than stocks. Why, then, would a person ever invest money in stocks instead of in bonds?

Brokers charge brokerage for both selling and buying bonds. A common rate is $2.50 per $1000 on corporation bonds; and a Federal tax of 50 cents per $1000 is added to the *seller's* expense in a bond transaction. The amount left after these expenses have been deducted from the *gross* (total) amount of a bond sale is usually referred to as the *seller's proceeds.* When bonds are bought between interest periods, the buyer must pay the seller the interest which the bond has earned since the last interest date. For example, on a 4% bond with face value of \$1000, the annual interest is \$40. If a person sells this bond six months after the last interest payment, he is entitled to \$20, or $\frac{1}{2}$ of the current year's interest.

Questions to Discuss and Things to Do

1. Prepare a poster for your bulletin board showing the differences between stocks and bonds.

2. Find the seller's proceeds on the sale of two corporation bonds at $1056\frac{3}{8}$ with par value of \$1000.

Solution. Amount of sale = 2 × 1056.375 = \$2112.75
Brokerage = 2 × 2.50 = 5.00
Federal tax = 2 × .50 = 1.00
Seller's proceeds = ?

3. Find the seller's proceeds on the sale of 10 corporation bonds at $878\frac{5}{8}$ with par value of \$1000.

4. Find out the difference between coupon and registered bonds. Which would you rather have? Why?

5. How much must be added for interest to the purchase price of a \$1000 bond bearing 4% interest if bought 3 months after the last interest payment?

6. Compute the seller's proceeds of the sale of 20 corporation bonds at $893\frac{1}{4}$ with face value of \$1000 each and bearing $3\frac{1}{2}$% interest. Assume the sale takes place 6 months after the last interest payment.

Solution. Proceeds from sale = 20 × 893.25 = ?
Proceeds from 6 months of year's interest $= \frac{20{,}000 \times .035}{2} =$?
Total gross proceeds = ?
Brokerage = 20 × 2.50 = ?
Federal tax = 20 × .50 = ?
Total expenses = ?
Seller's proceeds = ?

Bonds yield various interest rates.

When you hear people talking about a bond, sooner or later someone will ask, "What does it *yield?*" By "yield" we mean the rate at which an investment produces income. Thus, if Mr. Grove buys a 4% $1000 bond for $800, his current income from his investment will be $40 a year. His ***current yield*** then will be $\frac{40}{800} = .05$, or 5%. But there is another way to look at the question of how much his yield will be in a case like this. If he holds the bond until maturity 10 years hence, he will receive $1000 for it, thus gaining $200 over the purchase price. He may very well think of this $200 gain as an average profit of $20 a year. If this $20 is added to the $40 received in interest, the income each year becomes $60. In that case the yield is $\frac{60}{800} = .075$, or 7.5%. This is usually called the ***approximate yield.***

Problems to Solve and Things to Do

1. Compute the current yield on a 3% bond with $1000 par value if bought at $750.

2. Compute the current yield on a $4\frac{1}{2}$% bond with par value of $1000 if bought at $1200.

3. Mr. James bought a Consolidated Edison $3\frac{1}{2}$% bond with a par value of $1000 for $850. He held this bond 10 years until maturity. What was his approximate yield?

4. Mrs. Allen's 4% U. S. Treasury bond has just matured for $1000. Ten years ago she bought this bond for $1100. What was her approximate yield? (HINT. The loss on original principal invested must be deducted from the interest.)

***Special investigation* ***

5. Find out if there are any bonds outstanding on your school building. What interest rate is being paid? What date will they mature? What provision is the school board making to pay them off when due? Did they sell above par, below par, or at par? In case they sold a good deal above or below par, try to find out the reason. What is their approximate yield?

United States Savings Bonds are widely held.

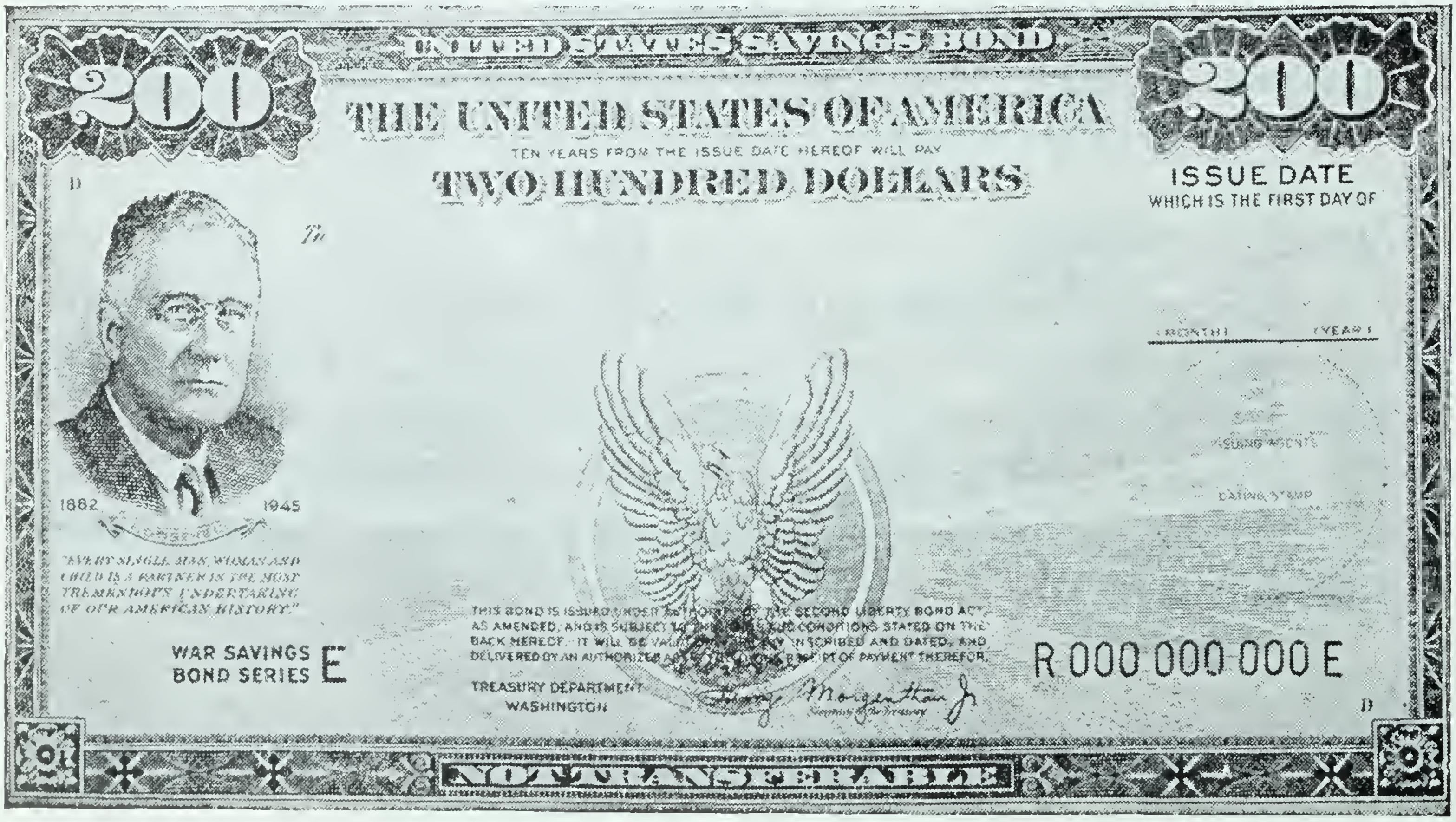
Have you ever been a bond salesman? Many high school students have been; for the Federal Government every day sells thousands of United States Savings Bonds through schools, banks, employers, and post offices. In fact, Savings Bonds are now the most generally held security in this country. It is not only the patriotic thing to do to buy U. S. Savings Bonds, but you are making the safest investment of your savings that you can make.

Series E United States Savings Bonds are sold in seven denominations: $25, $50, $100, $200, $500, $1000, and $10,000. They are sold on a *discount* basis. That is, instead of paying $25 for a $25 bond, you pay only $18.75. Held for 9 years and 8 months, the bond matures for $25, of which $6.25 is, of course, interest. There is no fee or tax connected with the sale or purchase of Series E Bonds.

A U. S. Savings Bond, Series E (and only Series E), may be held for 10 years after maturity for increased redemption values. The table of redemption values on the next page contains redemption values for only the $100 Series E Savings Bond. However, the redemption values of each of the other denominations in Series E is in proportion for each period shown. Thus, at 5 years after issue date the $25 bond is worth $\frac{1}{4}$ of $85.00, or $21.25, and the $500 bond is worth 5 × $85.00, or $425.00.

The U. S. Treasury Department also issues Savings Bonds in Series H, J, and K. Series H Bonds are sold to individuals only at par value

The $200 Savings Bond shown here and the $10,000 Savings Bond have been added to the original five denominations.



United States Treasury Department

UNITED STATES SAVINGS BOND

200

THE UNITED STATES OF AMERICA

TEN YEARS FROM THE ISSUE DATE HEREOF WILL PAY

TWO HUNDRED DOLLARS

200

ISSUE DATE
WHICH IS THE FIRST DAY OF

(MONTH) (YEAR)

ISSUING AGENTS

DATING STAMP

1882 1945

"EVERY SINGLE MAN, WOMAN AND CHILD IS A PARTNER IN THE MOST TREMENDOUS UNDERTAKING OF OUR AMERICAN HISTORY."

WAR SAVINGS BOND SERIES E

THIS BOND IS ISSUED UNDER [illegible] THE SECOND LIBERTY BOND ACT, AS AMENDED, AND IS SUBJECT [illegible] CONDITIONS STATED ON THE BACK HEREOF. IT WILL BE VA[illegible] INSCRIBED AND DATED, AND DELIVERED BY AN AUTHORIZE[illegible] PT OF PAYMENT THEREFOR.

TREASURY DEPARTMENT
WASHINGTON

Morgenthau Jr.

R 000 000 000 E

NOT TRANSFERABLE

of $500, $1000, $5000, and $10,000. The postman brings the accrued interest every six months, for a period of 9 years and 8 months.

Series J Bonds are sold below par value and accrue interest until maturity. Series K Bonds are sold at par value and interest is paid each six months. Both Series J and K mature in 12 years.

Postal Savings Certificates are another kind of government investment. They may be purchased at post offices in denominations of $1, $2, $5, $10, $20, $50, $100, $200, $500. Simple interest is paid on these deposits at the rate of 2% a year. Postal Savings Stamps may be bought for 10 cents each. Ten of these stamps can then be exchanged for a $1 certificate.

REDEMPTION VALUES ON A $100 SERIES E SAVINGS BOND

PERIOD HELD	FROM ISSUE DATE TO MATURITY		AFTER MATURITY DATE TO REDEMPTION	
	Purchase before May 1952	Purchase Date May 1952 or After	Purchase Date May 1942 to April 1952	Purchase Date May 1952 or After
First ½ year	$75.00	$75.00	$100.00	$100.00
½ to 1 year	75.00	75.40	101.50	101.50
1 to 1½ years	75.50	76.20	103.00	103.00
1½ to 2 years	76.00	77.20	104.50	104.50
2 to 2½ years	76.50	78.20	106.00	106.00
2½ to 3 years	77.00	79.20	107.60	107.60
3 to 3½ years	78.00	80.20	109.20	109.20
3½ to 4 years	79.00	81.20	110.80	110.80
4 to 4½ years	80.00	82.20	112.40	112.40
4½ to 5 years	81.00	83.60	114.00	114.00
5 to 5½ years	82.00	85.00	115.80	115.80
5½ to 6 years	83.00	86.40	117.60	117.60
6 to 6½ years	84.00	87.80	119.40	119.40
6½ to 7 years	86.00	89.20	121.20	121.20
7 to 7½ years	88.00	90.60	123.00	123.00
7½ to 8 years	90.00	92.00	124.80	124.80
8 to 8½ years	92.00	93.60	126.60	126.60
8½ to 9 years	94.00	95.20	128.60	128.60
9 to 9½ years	96.00	96.80	130.60	130.60
9½ to maturity (or extended)	98.00	98.40	132.60	132.60
9 years 8 months		100.00		
10 years	100.00		134.68	134.68

Redemption values for other denominations are directly proportional.

Questions to Discuss and Things to Do

1. A Savings Bond bought for \$150 and maturing for \$200 in nine years, 8 months earns $\underline{\ ?\ }$ in interest. \$50 is $\underline{\ ?\ }$% of \$150. The annual rate of interest is $.33\frac{1}{3} \div 9\frac{2}{3}$, or $\underline{\ ?\ }$%.

2. Plot a graph showing the redemption values for a \$75 bond for each half year until maturity. At what points does the yearly increase change? Assume purchase date is September 1953.

3. How much would you have to pay now for U. S. Savings Bonds Series E to yield \$600 in 9 years and 8 months?

4. Alice Grainger has three Postal Savings Certificates, one for \$20 which she has had for 3 years, one for \$10 which she has had for 5 years, and one for \$50 which she has had for 2 years. If she has collected no interest to date, how much interest has accumulated? (Remember the interest rate on these certificates is 2%.)

5. Series J Savings Bonds mature in 12 years. Like Series E Bonds, they are sold on a discount basis. The price and maturity values of six different denominations are given in this table.

ISSUE PRICE	MATURITY PRICE	ISSUE PRICE	MATURITY PRICE
\$18.00	\$25.00	\$720.00	\$1000.00
72.00	100.00	3600.00	5000.00
360.00	500.00	7200.00	10,000.00

A Series J \$100 Bond yields \$28 in interest on a \$72 investment in 12 years. To what annual simple interest rate is this equivalent? Is this more or less than the simple interest rate on Series E Bonds?

6.* Mr. Brown has three \$50 bonds, Series E, and four \$100 bonds, Series E, which he bought in July 1953. What will be the total redemption value of the seven bonds in February 1961? What will it be $4\frac{1}{2}$ years after the maturity date?

7.* Series H Savings Bonds are issued at par in denominations of \$100, \$500, \$5000, and \$10,000. The interest is paid twice a year, and the bonds mature in 9 years and 8 months. If a bond is held for 1 year, the interest rate is 1.65%, but if it is held until maturity, the interest rate is 3% a year. How much more would one get in interest for 1 year for a \$1000 Series H Bond held to maturity than for one redeemed after 1 year?

What's the
of the West W
Why the

Philip Genareau

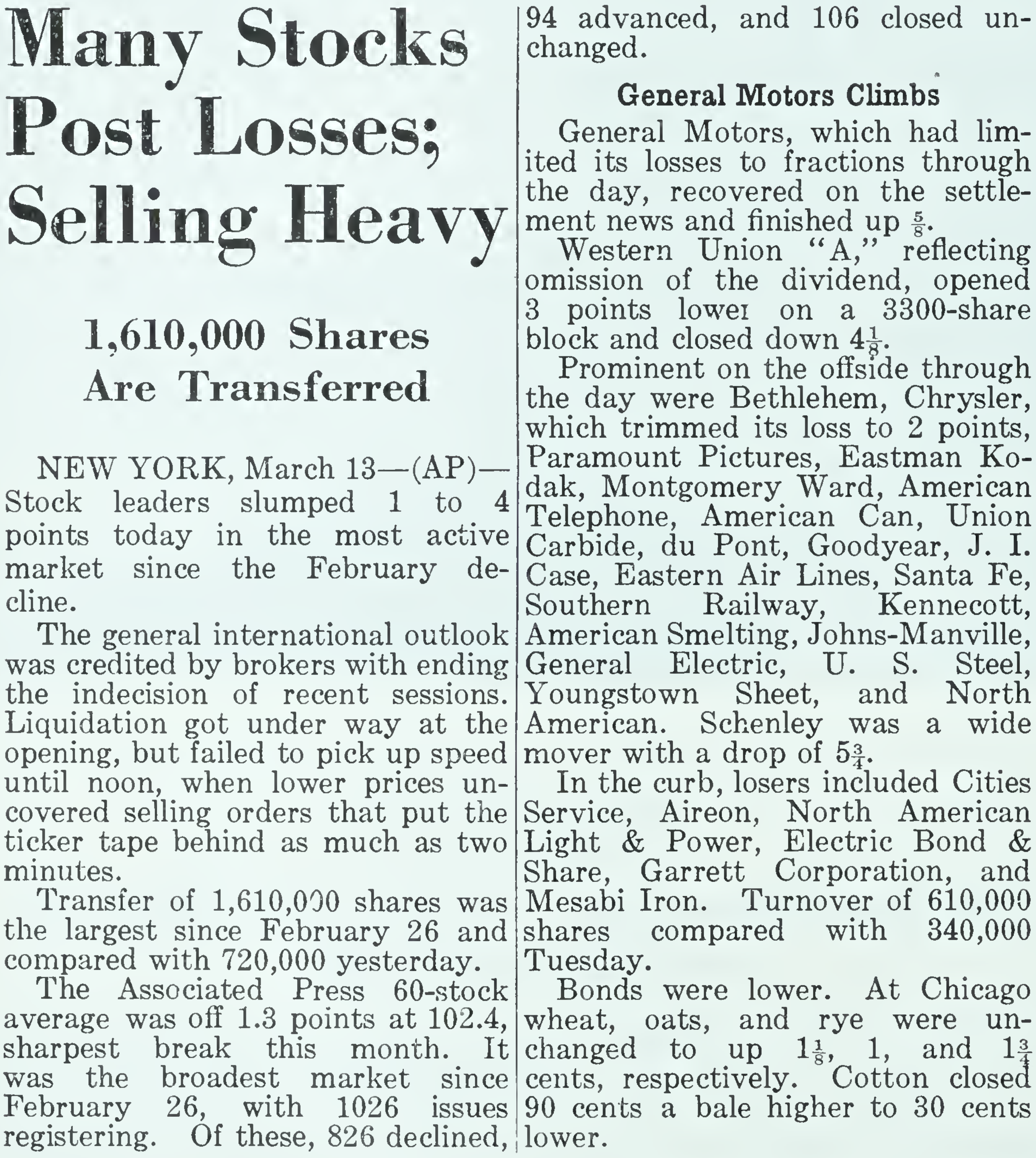
PROBLEM IV

Do You Know How to Read and Interpret Financial News?

Do you know where to find the financial section of the daily newspaper? What fractional part of the space in the morning or evening newspaper that comes to your home do you estimate is given to the financial section? This part of a paper should be read with interest by every person who makes a living, because it not only reports price changes of stocks and bonds, but it also pictures the trend of general business conditions both at home and abroad. If you wish to keep informed on current affairs, you will find financial news valuable reading.

Important information is given in lead articles.

Of great importance in the financial news is the lead article which summarizes the trend of the day's transactions on the Stock Exchange. This lead article usually gives some of the reasons for recent changes in prices, and often it includes a prediction as to what the market is expected to do in the near future. Here is a sample of a typical lead article.



Many Stocks Post Losses; Selling Heavy

1,610,000 Shares Are Transferred

NEW YORK, March 13—(AP)—Stock leaders slumped 1 to 4 points today in the most active market since the February decline.

The general international outlook was credited by brokers with ending the indecision of recent sessions. Liquidation got under way at the opening, but failed to pick up speed until noon, when lower prices uncovered selling orders that put the ticker tape behind as much as two minutes.

Transfer of 1,610,000 shares was the largest since February 26 and compared with 720,000 yesterday.

The Associated Press 60-stock average was off 1.3 points at 102.4, sharpest break this month. It was the broadest market since February 26, with 1026 issues registering. Of these, 826 declined, 94 advanced, and 106 closed unchanged.

General Motors Climbs

General Motors, which had limited its losses to fractions through the day, recovered on the settlement news and finished up $\frac{5}{8}$.

Western Union "A," reflecting omission of the dividend, opened 3 points lower on a 3300-share block and closed down $4\frac{1}{8}$.

Prominent on the offside through the day were Bethlehem, Chrysler, which trimmed its loss to 2 points, Paramount Pictures, Eastman Kodak, Montgomery Ward, American Telephone, American Can, Union Carbide, du Pont, Goodyear, J. I. Case, Eastern Air Lines, Santa Fe, Southern Railway, Kennecott, American Smelting, Johns-Manville, General Electric, U. S. Steel, Youngstown Sheet, and North American. Schenley was a wide mover with a drop of $5\frac{3}{4}$.

In the curb, losers included Cities Service, Aireon, North American Light & Power, Electric Bond & Share, Garrett Corporation, and Mesabi Iron. Turnover of 610,000 shares compared with 340,000 Tuesday.

Bonds were lower. At Chicago wheat, oats, and rye were unchanged to up $1\frac{1}{8}$, 1, and $1\frac{3}{4}$ cents, respectively. Cotton closed 90 cents a bale higher to 30 cents lower.

Ordinarily, in addition to the lead article, the financial news contains several articles by leading businessmen or industrialists, who discuss the present and future prospects of their own organizations. Such statements and predictions are especially valuable to those persons engaged in similar types of endeavor.

Questions on the Lead Article

1. Was the trend in stock prices up or down? Was the change in prices large or small?

2. Were more or fewer shares sold on this than on the preceding market day? Was the difference small or great? The difference in sales for the two days was what per cent of the total sales for the day represented?

3. What statement is made concerning bonds?

4. What effect did omission of dividend have on the price of a certain block of stock?

5. What were some of the stocks that dropped? Can you find one that advanced?

6. Can you explain what is meant by "put the ticker tape behind as much as two minutes"?

7. What report is given on prices of farm products?

8. Can you explain why the market was active during a slump of the stock leaders?

The stock market table contains much information.

In many large daily newspapers a whole page, or even more, is given to a table of quotations of prices of stocks and bonds on the New York Stock Exchange. Some papers also report prices on the New York Curb Exchange. Such a table gives in detail the prices of each stock listed on the Exchange. The Curb Exchange operates in a manner similar to the Stock Exchange; it gets its name from the fact that it originally did business outdoors (on the curb) instead of in a building. On the next page is a sample section of a table from the Stock Exchange. (Note that this sample covers only those organizations whose name begins with the letter A. You can readily see why a full page is required for the complete listing.)

Range 1952 High	Range 1952 Low	Stock and Div'd in Dollars	Sls. 100s	First	High	Low	Last	Net Chge.
125	108	Abbott L pf 4	1	113	113	113	113	+¾
8⅝	5⅝	A C F Brill	30	5⅞	6⅛	5⅞	6⅛	+¼
35⅜	30⅝	Adams Ex .90e	6	32⅞	33	32⅞	33	+¼
27⅞	24	Air Reduc 1.40	64	25½	26⅛	25½	26⅛	+⅞
3⅜	2¾	Alaska Jun	1	2¾	2¾	2¾	2¾	−⅛
115¼	79⅜	Alleg pf	7	114½	115¼	114½	115¼	+¾
46⅞	31⅞	Alleg L Stl 2a	49	37	37⅝	36⅝	37⅜	+1⅛
78⅜	67¼	Allied Che 2.40	36	74¾	75¼	74¼	75¼	+1⅛
21½	18	Allied Kid 1.60	6	18½	19	18½	19	+⅝
36	32½	Allied Mills 2a	9	33¾	34½	33⅝	34½	+1
56⅞	46¼	Allis Chal 4	75	56¾	56⅞	56⅜	56⅝	+⅛
113½	95¾	Allis Ch pf 3¼	8	113	113½	112½	113½	+1
54½	47¾	Alum Ltd 2	34	51	52½	50¾	52¼	+1⅞
92¼	73¼	Alum Co Am 3	43	84⅞	86⅛	84⅞	85⅞	+1⅜
70½	60¼	Am Ag Che 3a	5	69	69¼	69	69¼	+¼
16¾	12¼	Am Airlines ½e	130	13⅝	14	13⅝	14	+⅜
90	73	Am Airl pf 3½	1	80¼	80¼	80¼	80¼	+¼
19½	16⅛	Am Bk Note 1	1	18	18	18	18	−⅛
61½	55½	Am Bk N pf 3 †	z40	56	56	56	56	−1
15⅜	11¾	Am Bosch .90r	51	12⅛	12¼	12	12¼	+¼
53¼	45½	Am Bos pf 2¾	1	48	48	48	48	+½
12¾	8½	Am Brdcast	34	10¼	10¼	10	10	−¼
35⅜	28⅛	Am Can 1.40	46	34⅜	34½	34⅛	34½	+¼
45½	43½	Am Can pf 1¾	8	45⅜	45⅜	45⅛	45⅜	+¼
42⅞	31	Am Car & F 3b	11	33¾	33¾	33¼	33½	..
83½	73½	Am Car & F pf 7	3	76⅜	76⅜	76¼	76¼	−¼
50⅞	42¾	Am Chicle 2axd	7	50	50	49½	50	+¾
59¾	50½	Am Cyan 1	71	54	55⅞	54	55⅛	+1⅛
7¾	6	Am Enc. T½axd	3	7½	7⅝	7½	7⅝	+⅛
18¼	16⅛	Am Export 1½	7	17⅜	17⅜	17	17	−⅛
12½	7¼	Am & For P .10r	113	7¾	8⅛	7¾	8⅛	+½
65¾	58	Am Gas & El 3b	20	65½	65⅝	65½	65⅝	..
39⅞	35⅛	Am Ho Pd 1.80a	6	37⅝	37¾	37½	37¾	+½
8	5¾	Am Ice ½e	1	7	7	7	7	+⅛
23⅜	19⅞	Am Inv Ill 1.60	3	23	23	22⅞	22⅞	−⅛
21⅞	17½	Am Loco 1a	29	19¼	19½	19⅛	19½	+⅜
30¾	22¾	Am Metal 1a	20	24⅜	24⅜	23⅝	24⅛	+⅛
105	97	Am Met pf 4½ †	z20	103½	103½	103½	103½	−⅜
14¾	13	Am Met Pd ¾	10	14⅜	14½	14⅜	14⅜	..
8	7⅜	Am Molass .40a	1	7½	7½	7½	7½	..
34⅜	29	Am N Gas 1.80	52	32⅞	32⅞	32¼	32½	−⅛
36	31⅜	Am News 1½a	9	32	32	31¾	31¾	−⅛
36¼	28½	Am Optical 2	10	29½	29½	29	29½	+¾
16¾	13¾	Am Rad 1a	111	14½	14½	14¼	14⅜	−⅛
7⅝	6	Am Saf Raz ½	5	6	6⅛	6	6⅛	..
53	38⅞	Am Smelt 3	73	41	41⅝	40⅝	41	+½
165½	148	Am Smelt pf 7 †	z100	159½	160¾	159½	160¾	+1⅞
135½	127	Am Sug pf 7 †	z120	131¾	132¼	131¾	131¾	−½
16⅞	10⅛	Am Su Tob ½p	3	11⅝	11⅝	11⅝	11⅝	−⅛
157⅞	150⅞	Am Tel & Tel 9	151	157⅞	157⅞	157⅝	157⅝	−⅛
66	54⅜	Am Tob 3a	95	63⅝	64	63⅜	64	+¾
139¼	129½	Am Tob pf 6 †	z160	138¼	139¼	138¼	139¼	+1
69⅞	58	Am Viscose 2a	27	60	60½	60	60¼	+½
37¼	22¼	Am Woolen	16	23⅞	23⅞	23⅛	23⅛	−⅜
95¾	81½	Am Wool pf 7 †	z160	82¾	83	82½	83	+1
82	64⅝	Am Wool prpf 4 †	z340	65¼	65¼	64⅝	65	−¼
26⅜	16½	Am Zinc 1a	4	19	19	18⅞	19	+⅛
24½	12	Andes Cop 6e	1	13¼	13¼	13¼	13¼	+⅞
6⅞	4¾	A P W Prod	1	4⅞	4⅞	4⅞	4⅞	..
60	50	Arch D M 2.80	4	50½	51	50½	51	+1
27⅞	15⅝	Argo Oil .80	5	16¾	17	16¾	17	+¼
41¾	35½	Armco Stl 3	93	38½	38⅞	38⅛	38¾	+⅝
12⅞	8⅜	Armour	52	10⅛	10¼	10	10¼	+¼
96	77¼	Armour prpf3k	2	82¼	82¼	82	82	−1
57	46⅛	Armst Ck 2.60a	9	50¾	50¾	50¼	50¼	−¼
116½	107½	Arm Ck pf 4 †	z20	109	109	109	109	+½
99	92⅛	Arm Ck pf 3¾ †	z50	96½	96½	96½	96½	+½
9	7½	Artloom Cpt .30e	3	7⅞	7⅞	7⅞	7⅞	+¼
31½	25⅛	Arvin Ind 2	2	31	31	31	31	−½
23⅝	16½	Ashl Oil 1b xd	16	17	17¼	17	17¼	+¼
31	28⅜	Ashl O pf 1½xd	9	29⅛	29¼	29⅛	29¼	+⅞
22½	18¼	Assd Dry G 1.60	13	19½	19½	19¼	19⅜	−⅛
100	91	Assd Dry G 1pf 5¼†	z60	100	100	100	100	+2
98	91	Assd Dry G 2pf 6 †	z100	96½	96½	96	96	−½
84	66	Assoc Inv 4a	3	78½	79½	78½	79½	+¾
95¾	73½	Atchison 5a	18	92¼	92½	91¾	92	+½
58	51⅜	Atchison pf 2½	6	56	56½	56	56½	+½
118	76¾	Atl Cst Li 5a	6	106	106⅜	106	106⅜	+⅜
109	96½	Atl G & W 1 3e	7	107	107	107	107	..
36¼	31	Atl Refin 2	38	33⅛	33⅜	33⅛	33¼	+⅛
100¾	93⅜	Atl Ref pf 3¾ †	z50	98¾	98⅞	98¾	98⅞	+⅜
44½	31½	Atlas Pdr 2e	4	35	36⅛	35⅞	35⅞	+⅛
117½	102½	Atlas Pdr pf 4 †	z50	106	106½	106	106½	+2
17	14⅝	Aust N pf 1.20	2	16⅞	17	16⅞	17	..
9⅜	6	Autocar	5	6½	6½	6¼	6¼	..
8⅛	6⅞	Avco Mfg .60	68	8	8⅛	8	8⅛	+⅛

In the two columns on the left-hand side of the table appear the highest and lowest prices for which each stock has sold during the current year. In the third column appears the name of the corporation. Usually the name is abbreviated and you must know the name to understand the abbreviation. For example, "Am Tel & Tel" is the American Telephone and Telegraph Corporation.

Next follows information on dividends. The amounts of dividends shown are based on the last dividend declarations and are expressed as annual rates. "Am Can $1.40," for example, means that the last dividend of the American Can Company was at the rate of $1.40 a year per share of stock. Further information on the dividends may be given by letters or symbols which appear after these dividend figures. For this table the symbols have the following meanings:

a means also extra or extras.
b means dividends paid in additional stock of the company.
e means dividends paid or declared this year.
k means accumulated dividends paid or declared this year.
p means paid this year, omitted at previous meeting.
pf means preferred stock.
r means dividend declared plus stock dividend.
xd means extra dividend.
z means actual number of sales are listed.
† means the unit of trading is 10 shares instead of the usual 100 shares.

In the next column is listed the number of units of 100 shares each that were sold during the day (except as marked with † and *z*).

The next four columns give the prices for the day — the price at which the first sale of the day was made, the highest price, the lowest price, and the price at which the last sale was made.

The net change appears in the last column. The figures in this column show the amount of change between the closing price today and the closing price on the preceding day. Here a plus sign indicates that the stock closed today at a price higher than the closing price the day before. A minus sign indicates that the closing price today was lower than the preceding closing price. Thus "Am Bk N pf 3" with a net change of −1 indicates that the stock was 1 dollar a share less at closing for the day indicated than it was at closing on the preceding day.

Questions on the Stock Table

1. How much in dividends has Artloom Cpt. declared or paid on each share of stock during the current year?

2. How many shares of American Car and Foundry preferred were sold?

3. What were the high, low, and close on American Telephone and Telegraph? What was the net change?

4. What was the largest net change shown in this sample table? Was it a gain or a loss?

5. What have been the high and low prices on American Locomotive during the year?

6. Pick the five stocks with the least change in prices during the year, and five that have shown the most change.

7. The last price on American Car & F $7 preferred for the day given in the table is _?_. If this stock were bought at the closing price, what would be the dividend rate when figured on the cost of the stock?

8. Atlas Powder $4 pf annual dividend schedule would pay interest at the rate of _?_% if the stock were bought at the last price of 106 quoted in the table. How might future dividends on the stock influence the price? (HINT. See if you can find the latest quotation in your daily paper.)

9. If all the sales on American Export had been at the closing price, how much money (not counting brokerage fees and taxes) changed hands on this stock?

10. If you had bought 100 shares of Alleghany Corp. at the last price the preceding day, they would have cost _?_. If you sold at the last price of the day reported in the table, the gross sales would have been _?_. How much would you have made or lost by these two transactions, excluding taxes, commission, and registration fees?

11. How much would you have lost if in Ex. 10 you had been buying and selling American Broadcasting?

12. Select any five stocks showing a + net change and any five showing a − net change. Add the net changes for each group. Find the numerical difference between the + and − changes and divide by ten to find the average net change of these ten stocks. Is this average a gain or a loss?

13. What is the dividend rate on American Natural Gas at the last price quoted in this table?

14. Prices of bonds other than government bonds are quoted in a list just like the stock list. For example, a bond listed at $96\frac{3}{4}$ will cost $96.75 for each $100 of face value. What is the market value of bonds listed at $97\frac{1}{2}$, if they have a total face value of $10,000?

15. The prices of government bonds are listed in a different manner from other bonds. The list prices resemble decimals in appearance, as 94.12, but are not true decimals. Instead, the numbers to the right of the period are really 32nds, so that 94.12 means $\$94\frac{12}{32}$ for each $100 of face value. What is the market value of government bonds listed at 103.24 if their face value is $5000?

RENEWAL
MONEY

Philip Gendreau

Main trading room in New York Stock Exchange.

Tables and graphs show business and stock-market trends.

Mrs. Paulsen is the sole owner of a general merchandise store in her home town. She has operated this business successfully for many years. She is convinced that part of her success is due to her care in observing market trends. When stock-market averages and other business indexes are low, she always builds up her supply of goods. Then, when business indexes indicate higher prices and larger sales, she has an abundant supply on hand.

The three sections of the financial news in which Mrs. Paulsen is particularly interested are (*a*) the daily statement of the Dow-Jones stock averages covering 30 industrial stocks, 20 railroad stocks, and 15 public-utility stocks; (*b*) the graph showing daily averages for 50 combined stocks; and (*c*) the graph which pictures sales in United States department stores. This last chart shows conditions in businesses that are quite comparable to Mrs. Paulsen's business.

Problems to Solve and Things to Do

Dow-Jones stock averages

Dow-Jones Stock Averages

30 Industrials—		
Saturday	281.13	− .28
Friday	281.41	+1.06
Week ago	281.47	
4 weeks ago	249.83	
Year ago	220.08	
2 years ago	179.54	
1952 high 292.14, low	261.34	
1951 high 235.47, low	196.81	
20 Rails—		
Saturday	102.34	− .28
Friday	102.62	+ .47
Week ago	101.21	
4 weeks ago	95.39	
Year ago	65.91	
2 years ago	59.80	
1952 high 111.40, low	71.30	
1951 high 77.89, low	51.24	
15 Utilities—		
Saturday	50.21	+ .02
Friday	50.19	+ .16
Week ago	51.12	
4 weeks ago	49.88	
Year ago	47.61	
2 years ago	40.12	
1952 high 52.64, low	42.98	
1951 high 44.26, low	37.40	

Bankers, businessmen, and investors follow with keen interest the variation in the daily, weekly, monthly, and yearly average prices of selected stocks and bonds. Each day the Dow-Jones organization compiles and distributes average prices of 30 stocks of industrial companies, 20 rails, and 15 utilities. These compilations are popularly known as the Dow-Jones Stock Averages.

1. The Dow-Jones average of 30 *industrial* stocks was 281.41 for Friday. This was 1.06 above the Thursday average, which must have been _?_.

2. What must have been the Dow-Jones *rails* average for Thursday? What must have been the Thursday average for *utilities?*

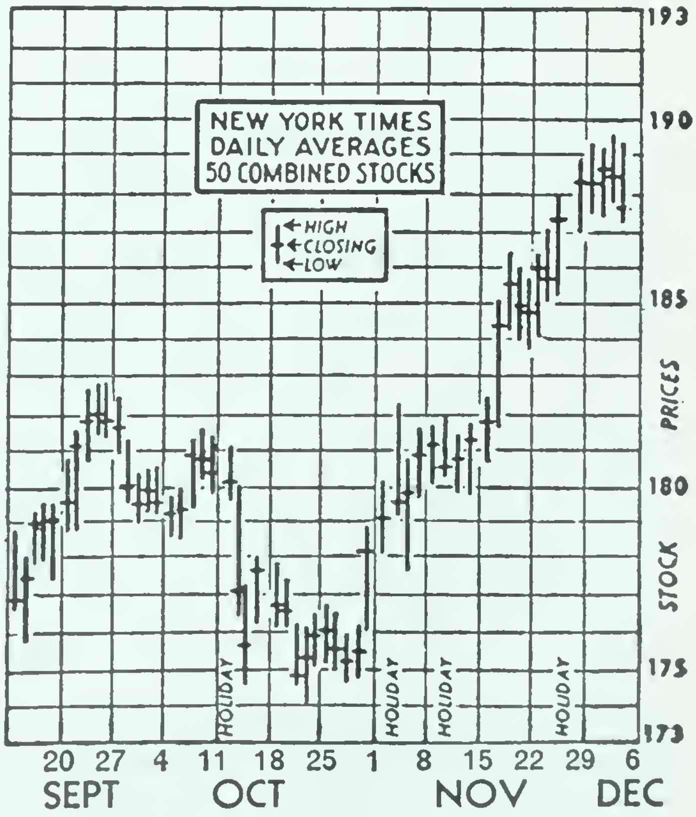
3. What would you say the Dow-Jones averages show concerning trends in each of the three classes of stocks over the past two years?

Daily averages

In many newspapers there appears a graph (like the one shown here) of the daily average prices of 50 selected stocks.

4. For each of the trading days there is a vertical bar with a short horizontal line drawn across it. The top of the vertical bar shows the average of the highest prices reached that day by 50 selected stocks. The bottom of this bar indicates the average of the lowest prices reached that day by these 50 stocks. The short horizontal line marks the average of the closing prices of these 50 stocks. For what period does the graph show great daily variation between the high price and the low price?

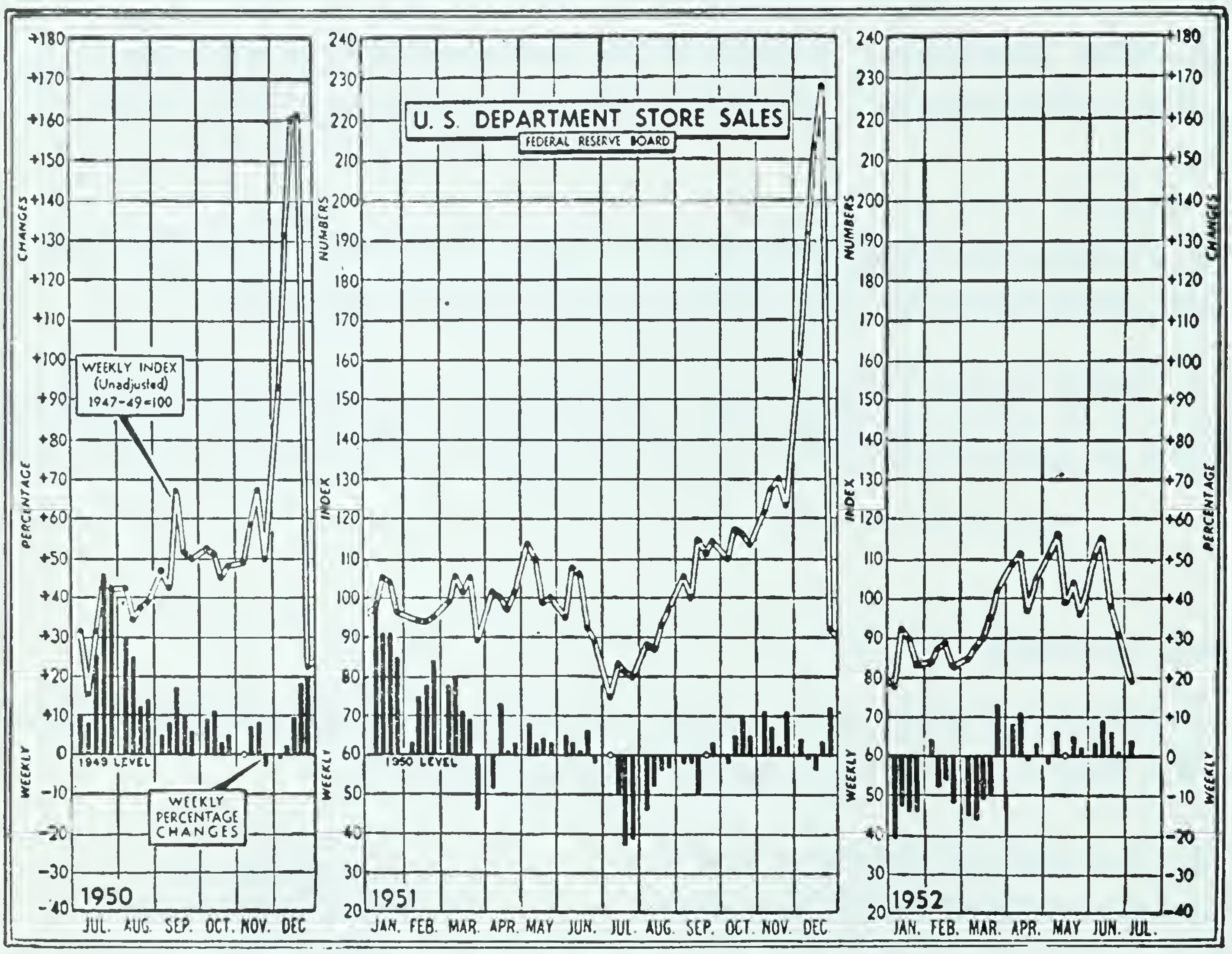
DAILY AVERAGES
50 COMBINED STOCKS



5. How much drop is pictured in closing prices between October 8 and October 22?

Weekly department store sales

Graph for U. S. Department Store Sales[1]



Here is a graph such as appears each week in the big city newspapers. It contains both line and bar graphs. The line graph pictures the weekly index for sales based on 1947–49 sales as 100. Hence, everything indicated by the graph is relative to the mean condition between 1947 and 1949. Index number scales are shown at the left for the years 1951–1952. Each bar of the bar graph shows the percentage change for any week as compared with the corresponding week of the preceding year. The percentage scales are at the outside.

6. What general trends are pictured in department-store sales for the time covered in the above graph?

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[1] To the Teacher. This is a difficult graph to read. It should be made clear to students that it is just as it appears in the newspapers. The press therefore assumes that people have ability to read a graph like this.

7. Consider first the line graph, which is based on index numbers. Note that the period 1947–1949 is used for reference purposes as 100. How do sales in 1950 in general compare with the 1947–1949 period? Is the same thing true for 1951 and 1952 sales?

8. Now consider the vertical bars, which show weekly percentage changes. Each year uses the preceding year as zero; and the vertical scale extends from −40 to +180. How do the 1950 weekly percentage changes compare in general with the 1949 level? How do the 1952 changes compare in general with the 1951 level?

9. Watch for a week or more the quotations of a stock or a bond in which you have a real or pretended interest. Picture the changes on a graph for your bulletin board.

10. Select from the financial news section of the daily paper clippings for your bulletin board which you think would interest your classmates. Be able to explain to the class what story each of the clippings tells.

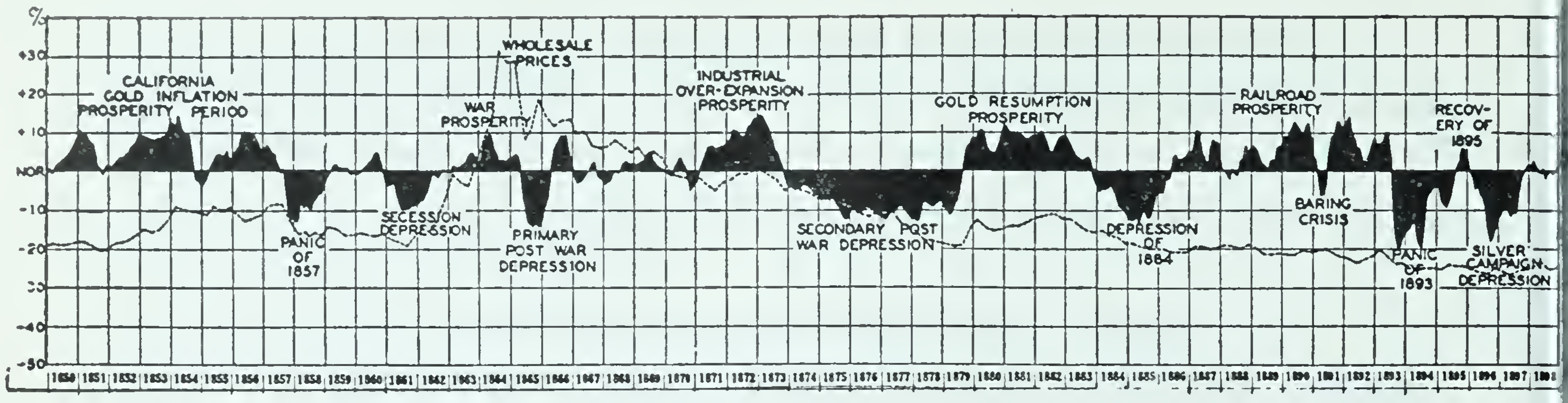
11. Pick five industrial stocks which you think are representative in their price changes. For a period of ten days, determine the daily averages of your five selected stocks, and also list the Dow-Jones daily averages for 30 industrial stocks. On the same axes draw two graphs, one for each set of averages. How do the two graphs compare?

12. For ten days, or more, watch the quotations on the common stock, preferred stock, and bonds of a single large corporation, such as United States Steel. Prepare on the same axes bar graphs showing the changes in these three types of securities. For which does the price vary most? For which does it vary least?

13*. Take a field trip to a broker's office and see how such an office operates. Make a report on some feature of operation that was of particular interest to you.

14. Organize and operate a "pretend" broker's office in your classroom.

AMERICAN BUSINESS



PROBLEM V*

How Are Investments and Savings Affected by Business Activities?[1]

At various times you have heard two or more persons discussing inflation or deflation. Perhaps someone recalls that in the past every period of inflation was followed by a period of deflation. The conditions which cause these changes are many. If you will look at the graph of American Business Activity since 1850, which appears above, you will see the numerous changes that have occurred throughout the past hundred years. And the chart indicates that usually a national or an international crisis has resulted in a radical change in business conditions.

The chart shows clearly that the period of prosperity caused by the discovery of gold in California was followed by a period of depression for about five years, which, in turn, preceded war prosperity. It also shows that the period of corporate prosperity early in the 20th century was followed by the panic of 1907.

The purchasing power of the dollar varies with these variations in business conditions. Thus, you may invest a dollar when its buying power is low and get back your dollar when its buying power is high; or you may invest a dollar when its buying power is high and get back your dollar when its buying power is low.

Just for the purpose of comparison, assume that the purchasing power of a dollar in 1945 is considered to be 100 cents and that you invest a dollar during that year. In 1955 you get back your original

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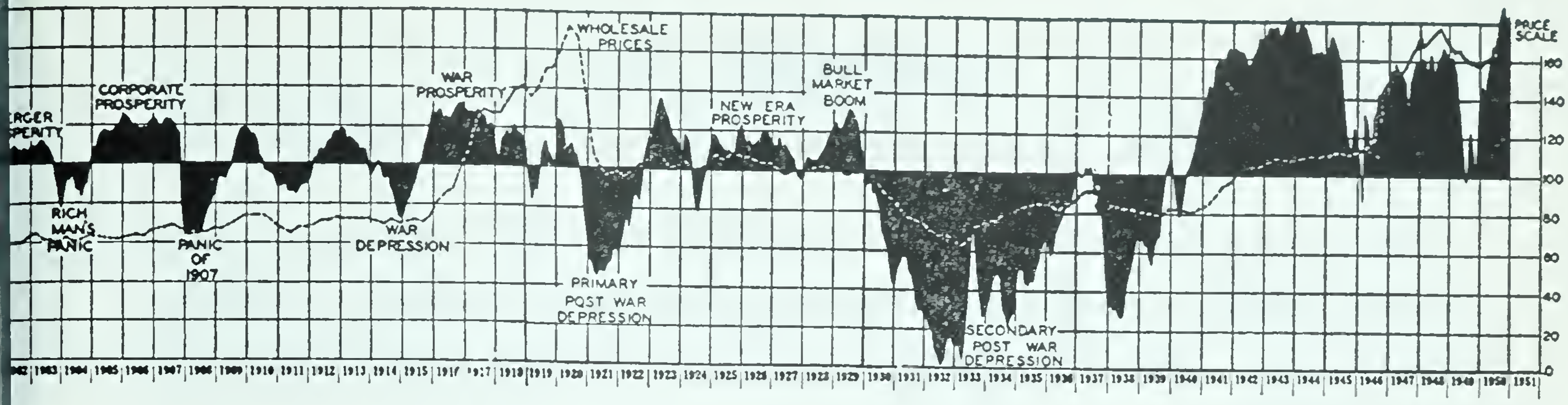
[1] TO THE TEACHER. If the students show sufficient interest in this problem, it may be advantageous to have the class bring articles from current publications which discuss inflation and deflation.

ACTIVITY SINCE 1850



Cleveland Trust Company

investment of one dollar. But in 1955 a dollar would buy only 58% as much of the same consumer goods as it did in 1945, when you invested it. That is, the purchasing power of your 1945 dollar is reduced to 58 cents in 1955. So you really have invested one dollar in purchasing power and got back 58 cents in purchasing power. Neglecting interest, you have actually lost 42 cents because of the reduction in the purchasing power of the dollar during the 10-year period of investment.

Questions to Discuss and Things to Do

1. Can you find on the chart two or more places which show comparable business conditions before, during, and after wars?

2. Assume that between 1953 and 1963 the purchasing power of the dollar is reduced by 35%. How much will a $100 United States Savings Bond, Series E, purchased in 1953 really be worth at maturity? Is it worth as much as you paid for it originally?

3. Assume that between 1953 and 1963 the purchasing power of the dollar is increased by 35%. How much will a $100 United States Savings Bond, Series E, purchased in 1953 really be worth at maturity? How much would you have gained in actual purchasing power?

4. Suppose you purchased a share of a certain stock for $86 in 1949 and you sold it for $102 in 1957. If the purchasing power of the dollar had decreased 30% during that time, would you really be making a profit on the transaction? (Disregard dividends on original investment, taxes, and commissions.)

5. Suppose you purchased a share of a certain stock for $112 in 1953 and you sold it for $100 in 1958. If the purchasing power of the dollar had increased 20% during that time, would you really lose on the transaction? (Neglect any dividends, taxes, and commissions.)

PROBLEM VI

Can You Compute Interest an Easy Way?

For a long time it has been considered fair that anyone who lent money should be paid for letting someone use his money. Just as a landlord may expect to receive rent when someone uses his property, so a moneylender may rightly expect to receive interest for his money (interest on his investment). In order that the person who needs to borrow money may not be charged interest at too high a rate, states have set legal limits. Six per cent is the limiting legal rate in most states for all but small loans. As explained in Unit IV, states with a law governing small loans may allow rates as high as 42% for loans not larger than $300.

Bankers use a Sixty-Day Method.

Both the person who borrows and the one who lends money should know how to compute interest accurately. Suppose, when you finish school, you borrow $100 from a member of your family in order to go to a distant town to take a job. If you pay this money back in 6 months' time, what interest should you pay at a 5% rate? Here, as in every other interest problem, you may rely on the basic interest formula: $I = prt$, where I = amount of interest, p = amount of principal, r = rate per year, and t = time in years. The interest on your $100 loan for 6 months at 5% may be found like this:

SOLUTION. Writing the formula: $I = prt$
Substituting for p, r, and t: $I = 100 \times .05 \times \frac{1}{2} = \$2.50$

This problem may be solved more simply by using the ***Bankers' Sixty-Day***, or ***Six-per-Cent, Method*** for applying the formula.[1] Let us see how this six-per-cent method works. This method of computing simple interest assumes that there are 360 days in a year. Now suppose that you wish to find the interest on \$350 at 6% for 60 days. Since 60 days is $\frac{1}{6}$ of a 360-day year, you may substitute $\frac{1}{6}$ for t in the interest formula $I = prt$, and get:

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[1] TO THE TEACHER. The rate of interest has dropped in recent years. Lending money at 6% is nowadays the exception rather than the rule. Nevertheless, a good deal of space is given here to the six-per-cent method for two reasons: (1) The six-per-cent method, as suggested by the exercises, is the basis for the short cuts commonly used to compute interest at other rates; and (2) practice with the method provides an opportunity for mental arithmetic which illuminates the meaning of the basic interest formula.

$$I = \$350 \times .06 \times \tfrac{1}{6} = \$350 \times .01 = \underline{\ ?\ }$$

What is the interest on \$425 at 6% for 60 days? In this case:

$$I = \$425 \times .06 \times \tfrac{1}{6} = \$425 \times \underline{\ ?\ } = \underline{\ ?\ }$$

Complete the following rule: *To find the interest on any amount of principal at 6% for 60 days, move the decimal point* ? *places to the left.*

Use this rule to find the interest for 60 days at 6% on \$530. Your work should look like this:

The interest on \$530 for 60 days is \$5.30.

Next find the interest on \$530 at 6% for 6 days. Note that 6 days is $\frac{1}{10}$ of 60 days, and the interest for 6 days is, therefore, $\frac{1}{10}$ of the interest for 60 days, or:

The interest on \$530 at 6% for 6 days is: .1 × \$5.30 = \$0.53.

What is the interest on \$950 at 6% for 6 days? According to the rule you just completed, the interest on \$950 for 60 days would be \$9.50. For 6 days, then, the interest is ?.

Now see if you can complete this rule: *To find the interest on any amount at 6% for 6 days, move the decimal point* ? *places to the left.*

Problems to Solve

1. Use the two rules you have just developed to find the interest on each of the following amounts at a 6% rate. You should be able to do most of them without pencil and paper.

(*a*) \$600 for 60 days
(*b*) \$550 for 60 days
(*c*) \$1500 for 6 days
(*d*) \$2000 for 6 days
(*e*) \$75 for 60 days
(*f*) \$80 for 6 days
(*g*) \$100 for 6 days
(*h*) \$2300 for 60 days
(*i*) \$420 for 6 days

Now try these for periods other than 6 and 60 days:

2. Find the interest on \$350 for 30 days at 6%. Think: The interest for 60 days is \$3.50 and for 30 days is $\frac{1}{2} \times \$3.50 = \underline{\ ?\ }$.

3. Find the interest on \$440 for 120 days at 6%. Think: The interest for 120 days is ? times the interest for 60 days, or ?.

4. Find the interest on \$1500 for 18 days at 6%. Think: The interest for 18 days is __?__ times the interest for 6 days, or __?__.

5. Find the interest on \$400 for 3 days at 6%. Think: The interest for 3 days is __?__ of the interest for 6 days, or __?__.

6. Find the interest on each of the following amounts when the rate is 6%:

(*a*) \$750 for 12 days
(*b*) \$900 for 2 days
(*c*) \$1200 for 20 days
(*d*) \$500 for 24 days
(*e*) \$450 for 4 days
(*f*) \$1500 for 9 days
(*g*) \$1000 for 90 days
(*h*) \$2200 for 300 days
(*i*) \$600 for 150 days

Use the method for per cents other than 6%.

How can this six-per-cent method be applied when rates of interest are other than 6%? Let's look back at your problem of borrowing \$100 at 5% for 6 months. According to the six-per-cent method, you would be borrowing for 180 days, or 3 × 60 days. The interest for 60 days on \$100 is \$1, and for 180 days it is 3 × \$1, or \$3. But you were required to pay only 5%, which is $\frac{5}{6}$ of 6%. Thus you paid $\$3.00 \times \frac{5}{6} = \$2.50$ interest.

What is the interest on \$840 at $1\frac{1}{2}\%$ for 6 days? At 6% the interest would be \$.84. And $1\frac{1}{2}\%$ is $\frac{1}{4}$ of 6%; so your interest is $\$.84 \times \frac{1}{4} =$ __?__.

Problems to Solve

1. Find the interest on \$380 for 60 days at 3%. Think: The interest for 60 days at 6% is \$3.80, and since 3% is $\frac{1}{2}$ of 6%, the interest at 3% is $\frac{1}{2} \times \$3.80 =$ __?__. (Borrower pays for fractions of a cent.)

Find the interest on the following:

2. \$400 for 60 days at 2%.

3. \$400 for 120 days at 2%.

4. \$1000 for 90 days at 4%.

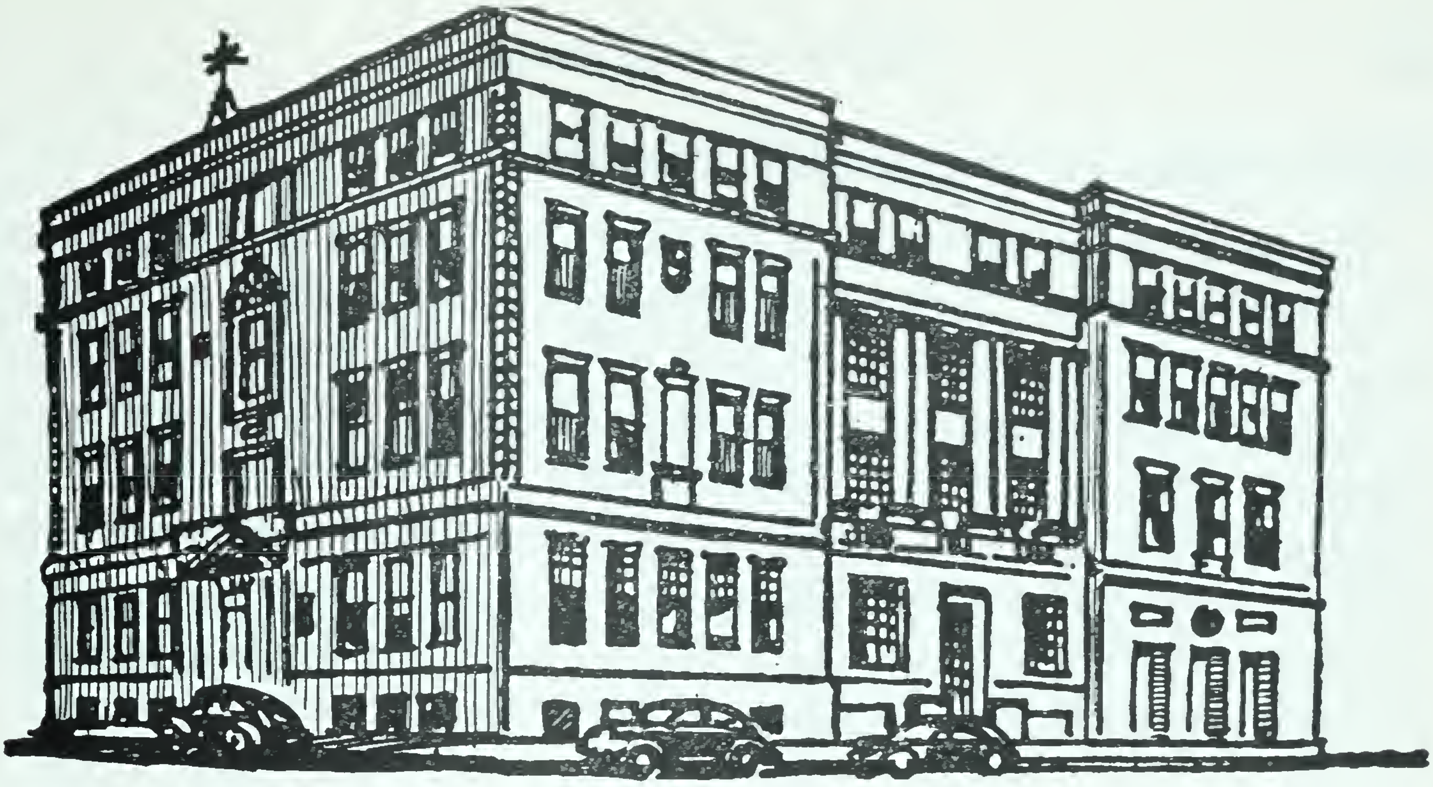
5. \$275 for 30 days at 8%.

6. \$1200 for 150 days at 3%.

7. \$1800 for 210 days at 5%.

8. \$1500 for 180 days at $4\frac{1}{2}\%$.

9. \$1600 for 270 days at $1\frac{1}{2}\%$.



Franklin Union Technical Institute of Boston was built at a cost of $402,718. The money came from a gift made by Benjamin Franklin 116 years earlier. The gift was only 1000 pounds — about $5000. Compound interest did the rest.

PROBLEM VII

How May Compound Interest Work for You?

Do you have a little money that you are saving for a special purpose in the somewhat distant future? If you do, how would you like to invest it so that you would have maybe twice as much when you finally need it? All you have to do is put it in a savings bank and let it stay there long enough. If you deposit $10 today in a bank that pays 2% interest compounded annually, 50 years from today you may collect $26.91.

In 1927 a graduate of the College of William and Mary left $3.50 to his alma mater. This was his total bank balance when he finished college. In his gift he specified that the college should not use the money until the year 2227. Assuming that $3.50 can be invested at 2% compounded annually, the college would have $1330.70 in 2227. At the time the gift was made banks were paying 4% interest compounded annually. If this rate had continued until 2227, the college would have had approximately $450,000.

One hears many stories of how compound interest has made money grow. Nearly every bank has at least one account for which the depositor cannot be located. In the meantime interest accumulates and, when the depositor returns after many years, he is surprised to find that his account is so much bigger than he thought.

Use a table of compound interest.

The table on the next page is the kind which banks use to compute compound interest. It shows how much $1 will amount to at the end of a number of years at various rates of interest. Here you see that, at the end of 10 years, $1 amounts to $1.2190 at 2% interest compounded annually. At 3%, $1 amounts to $1.3439. To find how much any other amount, say $5, would produce in 10 years, you have only to multiply the amount for $1 by 5. Thus, to find the amount which $5 will produce in 10 years at 3% interest compounded annually, you multiply $1.3439 by 5 and get $6.7195, or $6.72.

Problems to Solve and Things to Do

1. Use the table to find how much $1 will amount to when interest is compounded annually at 2% for 5 years; at 3½% for 10 years; at 4% for 15 years; at 2½% for 30 years; at 6% for 50 years.

2. How much will $10 amount to when interest is compounded annually at 2½% for 4 years? $100 at 3½% for 10 years? $1000 at 4% for 40 years? $500 at 2% for 55 years? $450 at 3% for 20 years?

3. If interest is compounded semiannually, this table can still be used. Find how much $1 will amount to at the end of 10 years with interest compounded semiannually at 4%.

Interest compounded semiannually at 4% means that every six months, or half year, 2% interest is added to the principal. Thus, at the end of the first year the principal and interest on $1 at 4% compounded semiannually is the same as though the $1 had been invested for 2 years at 2% interest compounded annually. This means that principal and interest for 10 years compounded semiannually at 4% is equivalent to principal and interest for 20 years compounded annually at 2%. So, from the table we read that $1 will amount to $1.4859 in _?_ periods at _?_%.

4. How much will $50 amount to at the end of 20 years when compounded semiannually at 4%? at the end of 15 years when compounded semiannually at 6%?

COMPOUND INTEREST TABLE

PERIOD OF YEARS	RATE OF INTEREST						
	1%	2%	$2\frac{1}{2}\%$	3%	$3\frac{1}{2}\%$	4%	6%
1	1.0100	1.0200	1.0250	1.0300	1.0350	1.0400	1.0600
2	1.0201	1.0404	1.0506	1.0609	1.0712	1.0816	1.1236
3	1.0303	1.0612	1.0769	1.0927	1.1087	1.1249	1.1910
4	1.0406	1.0824	1.1038	1.1255	1.1475	1.1699	1.2625
5	1.0510	1.1041	1.1314	1.1593	1.1877	1.2167	1.3382
10	1.1046	1.2190	1.2801	1.3439	1.4106	1.4802	1.7908
15	1.1610	1.3459	1.4483	1.5580	1.6753	1.8009	2.3966
20	1.2202	1.4859	1.6386	1.8061	1.9898	2.1911	3.2071
25	1.2824	1.6406	1.8539	2.0938	2.3632	2.6658	4.2919
30	1.3478	1.8114	2.0976	2.4273	2.8068	3.2434	5.7435
35	1.4166	1.9999	2.3732	2.8139	3.3336	3.9461	7.6861
40	1.4889	2.2080	2.6851	3.2620	3.9593	4.8010	10.2857
45	1.5648	2.4379	3.0379	3.7816	4.7024	5.8412	13.7646
50	1.6446	2.6916	3.4371	4.3839	5.5849	7.1067	18.4202
55	1.7285	2.9717	3.8888	5.0821	6.6331	8.6464	24.6503

5. According to the will of Mr. James Grant, he had deposited $500 in the local savings bank in the name of his grandson, Joseph Grant, at the boy's birth. For the first 4 years after Joseph's birth the bank paid 6% interest on deposits; then for the next 10 years the bank paid 4%; for the following 3 years the interest rate was 3%; and for the ensuing 5 years the rate was only 2%. What was the accumulated total, if the interest was compounded annually?[1] (Interest not generally paid on fractional parts of a dollar.)

SOLUTION.

Step 1. $500 for 4 years @ 6% is 500 × 1.2625 = __?__ (drop cents)
Step 2. $631 for 10 years @ 4% is 631 × 1.4802 = __?__ (drop cents)
Step 3. $__?__ for 3 years @ 3% = __?__ (drop cents)
Step 4. $__?__ for 5 years @ 2% = __?__

Hence the total accumulated balance for the 22 years was $__?__.

---

[1] TO THE TEACHER. In recent years some banks have adopted a policy of discontinuing interest payments on accounts that remain inactive (no deposits and no withdrawals) over a period of 10 years. However, in this exercise it is assumed that interest payments continue throughout the entire period of 22 years.

6. Here is a section of a page from Frank Parsons' passbook for his savings account. Make a copy and fill in the interest that Frank gets, and also the balances. Use the rules given below.

DATE			INTEREST	WITHDRAWAL	DEPOSITS	BALANCE
Jan	17	51			100 00	100 00
Feb	16	51			100 00	200 00
June	1	51			50 00	250 00
July	2	51				
Aug	31	51			50 00	
Dec	24	51		150 00		
Jan	1	52				
Mar	18	52			87 18	
July	1	52				
July	17	52		50 00		
Nov	2	52			75 00	
Jan	1	53				
Feb	15	53			83 00	
July	1	53				

(*a*) A deposit after the first of the month does not draw interest until the first of the following month.

(*b*) No interest is paid on parts of a dollar.

(*c*) The interest rate is 2%, compounded semiannually — on January 1 and July 1.

(*d*) A deposit must be made at least 90 days before the end of an interest period to earn interest in that period.

(*e*) No interest is allowed on any amount withdrawn during an interest period. (If money is deposited within an interest period and some money is withdrawn during the same period, no part period interest is computed on the portion of the deposit which is withdrawn.)

Ewing Galloway

If Mary deposits \$2 each week and the bank pays 2% interest compounded semi-annually, how much will she have on deposit at the end of 5 years? How much will she have on deposit if the bank pays 2½% interest?

7. Prepare two line graphs on the same axes. Let one show the accumulations of $1 at 6% simple interest. Let the other show the accumulations of $1 at 6% interest compounded annually. (Use the compound interest table for data for your second line graph.)

Special investigations

8. Visit a bank in your community and find out in what years changes were made in interest rates during the past 20 years. Assume that $10 was deposited in your name at the time of your birth. Use the bank's various interest rates and determine your balance as of today if interest is compounded annually.

9.* Make a study of the way a building and loan association operates. In some communities such an organization plays an important part. The resemblance to a savings bank is so great that the title "Savings and Loan Association" is frequently used. Also, a building and loan association has some of the features of a stock company. If you do decide to make this investigation, be sure to include (*a*) the four ways in which a person may deposit money with a building and loan association, (*b*) the source of the interest paid to the depositor, (*c*) whether loans are made to nonmembers, (*d*) whether a share can be bought on the installment plan, and (*e*) the dividend rate.

10.* Prepare a report on a bank. Here are some things you may want to find out, perhaps by interviewing someone at the bank: (*a*) What depositor's insurance is provided? (*b*) What service charges are made on checking accounts? (*c*) Is there a savings department? If so, what interest rate is paid? (*d*) Is there a small-loan department? If so, what rate of interest is charged? (*e*) What is the policy in making commercial loans? (*f*) What dividend rate did the bank pay on its stock last year? (*g*) What are the miscellaneous or special services which the bank renders, such as Christmas Savings Clubs? What are some methods of exchange which the bank provides and which are not included in this unit? (*h*) What are opportunities for young persons to be employed by the bank? (*i*) What type of worker is sought? (*j*) Have the young people recently employed exhibited shortages in fundamental training?

Final Test on Unit V

PART I: NEW WORDS

1. Some terms particularly applicable to this unit appear in Column B. Situations which are illustrations of uses of these terms appear in Column A. You are to find a term in Column B which you think fits each situation in Column A. Copy the letters *b* to *g* and put the number of the correct term opposite the letter corresponding to the statement in Column A. The first statement is marked as a sample.

		COLUMN A	COLUMN B
7	(*a*)	The Jones Promotion Company is drilling an experimental oil well near Tom Best's home. Tom has put $500 in the project.	1. Bonds
?	(*b*)	Bill Baker has just received a check from the company in which he owns some stock.	2. Brokerage
?	(*c*)	Mrs. Moore followed her broker's advice and invested her deceased husband's insurance money in the kinds of stock most likely to produce a regular income.	3. Compound interest
?	(*d*)	Fred Olds has sold 100 shares of stock. He is figuring how much he should receive from his broker for the sale. From the price of the stock he must deduct both taxes and selling charges.	4. Dividends
?	(*e*)	The Meadowbrook city council has voted to borrow $50,000 to build a new park. Fifty certificates of $1000 each are to be sold. They are to be redeemed over a period of 20 years.	5. Seller's proceeds
?	(*f*)	Helen Price says she'd rather have United States Savings Bonds than Postal Savings Certificates because you get only simple interest on Postal Savings, while on Savings Bonds you get interest on interest.	6. Preferred stocks
?	(*g*)	Mary Hahn sold 10 shares of United States Steel for $55 a share. She received only $546.35 from her broker on the sale.	7. Speculation

PART II: PROBLEMS

2. What is the current yield on a 2% $1000 bond that is bought for $800?

3. You will recall that a United States Savings Bond, Series E, bought for $750 matures in 9 years, 8 months for $1000. How much interest accumulates in this period? How much is this for each year if equally distributed over the total maturity period of 9 years and 8 months?

4. A stock which had a closing price of $58\frac{1}{4}$ yesterday and a closing price of $60\frac{7}{8}$ today shows a net change of _?_.

5. Alice Brent's family spent $500 a year for food in 1948. If food prices today have advanced 36% above the 1948 prices, the same foods would now cost _?_ a year.

6. What is the interest on $150 at 6% for 60 days? for 90 days? for 12 days? for 6 days?

7. Bainbridge City sold $100,000 worth of bonds to be paid back at the rate of $10,000 each year for 10 years. The interest rate was $3\frac{1}{2}$%. What was the total amount of interest paid over the 10-year period?

8. A corporation's capital includes $750,000 in preferred stock with a par value of $100 per share, and $750,000 in common stock with a par value of $25 per share. (*a*) How many shares of each class of stock are outstanding? (*b*) If the directors declare dividends of 5% on its preferred stock and $1.50 per share on its common stock, how much money will the company pay out in dividends?

9. According to the guide for investors, do you think the following investment is good, fair, or poor? List the favorable and unfavorable points.

Arthur Ferguson has saved $3000. He is building a two-family house at an estimated cost of $10,000. He plans to live in one half of the house and to rent the other half. He believes that he can charge enough rent to pay the charges on his mortgage and the taxes on the property.

PART III: ANALYZING AN INVESTMENT

10. Jane Garth has a good friend who works in the office of a large industrial corporation in New York. Recently Jane's friend wrote that her company was going to build a plant in Jane's home town, to manufacture a new plastic. Jane's friend thought it would be a good thing to invest in some of the company's common stock before the expansion plan became generally known. She expected the stock to advance in price as soon as the announcement was made. What advice would you give Jane?

(*a*) Follow the tip and invest all her savings.
(*b*) Investigate further before deciding.
(*c*) Disregard the tip and keep her money in a savings bank.

From the following list of statements select the ones which you think provide good reasons to support the advice you would give Jane.

1. Advance investment information like this is seldom reliable.

2. Buying stock would be highly speculative, for this is an experimental venture which may fail, may be moderately successful, or may be extremely successful.

3. No investment is better than the reputation of the management behind it.

4. Taxes or labor conditions can operate to make an otherwise safe investment unsound.

5. The dividend history of a company is a good indication of its reliability.

6. Many millions have been made by persons who seized opportunities that others ignored.

7. There are so many new uses being found for plastics that there must be a large demand for the product of the new enterprise.

8. A large industrial corporation would not invest in a new locality for plant expansion unless it was sure of a substantial profit.

9. Jane might make more in a single year by putting her money in this stock than she could get from a savings account in ten years.

10. Savings banks can fail, just as corporations can.

11. Jane's good friend would certainly not advise her wrongly.

TESTS ON PER CENTS

Inventory Test 13: Per Cent of a Number

Time, 4 minutes.

25% of 40 =
50% of 60 =
40% of 20 =
70% of 180 =
$16\frac{2}{3}$% of 120 =
$62\frac{1}{2}$% of 40 =
$33\frac{1}{3}$% of 72 =
$12\frac{1}{2}$% of 56 =
8% of 700 =
35% of 7850 =
75% of 800 =
3% of 6500 =
$83\frac{1}{3}$% of 1200 =
340% of 65 =
$37\frac{1}{2}$% of 1728 =
$66\frac{2}{3}$% of 30 =
35% of 700 =
.7% of 29 =

Answers on page 424. If you failed to pass this test, you should study pages 394–402 and do Practice Test 13 A on page 420.

Inventory Test 14: Per Cent One Number Is of Another

Time, 4 minutes.

What fractional part of —

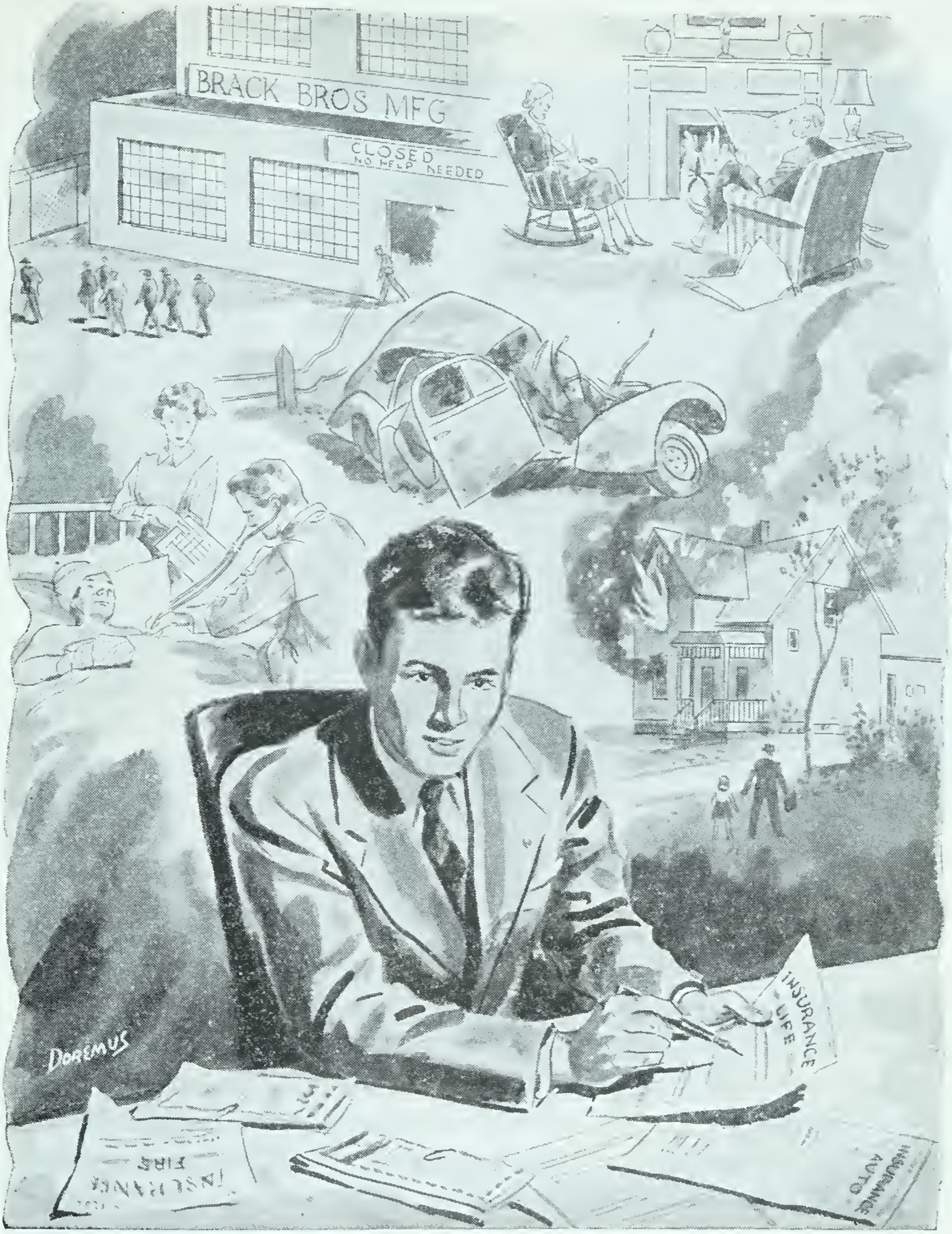
1. 18 is 6?
2. 24 is 12?
3. 200 is 50?
4. 15 is 3?

What per cent of —

5. 24 is 8?
6. 2 is 6?
7. 20 is 18?
8. 30 is 24?

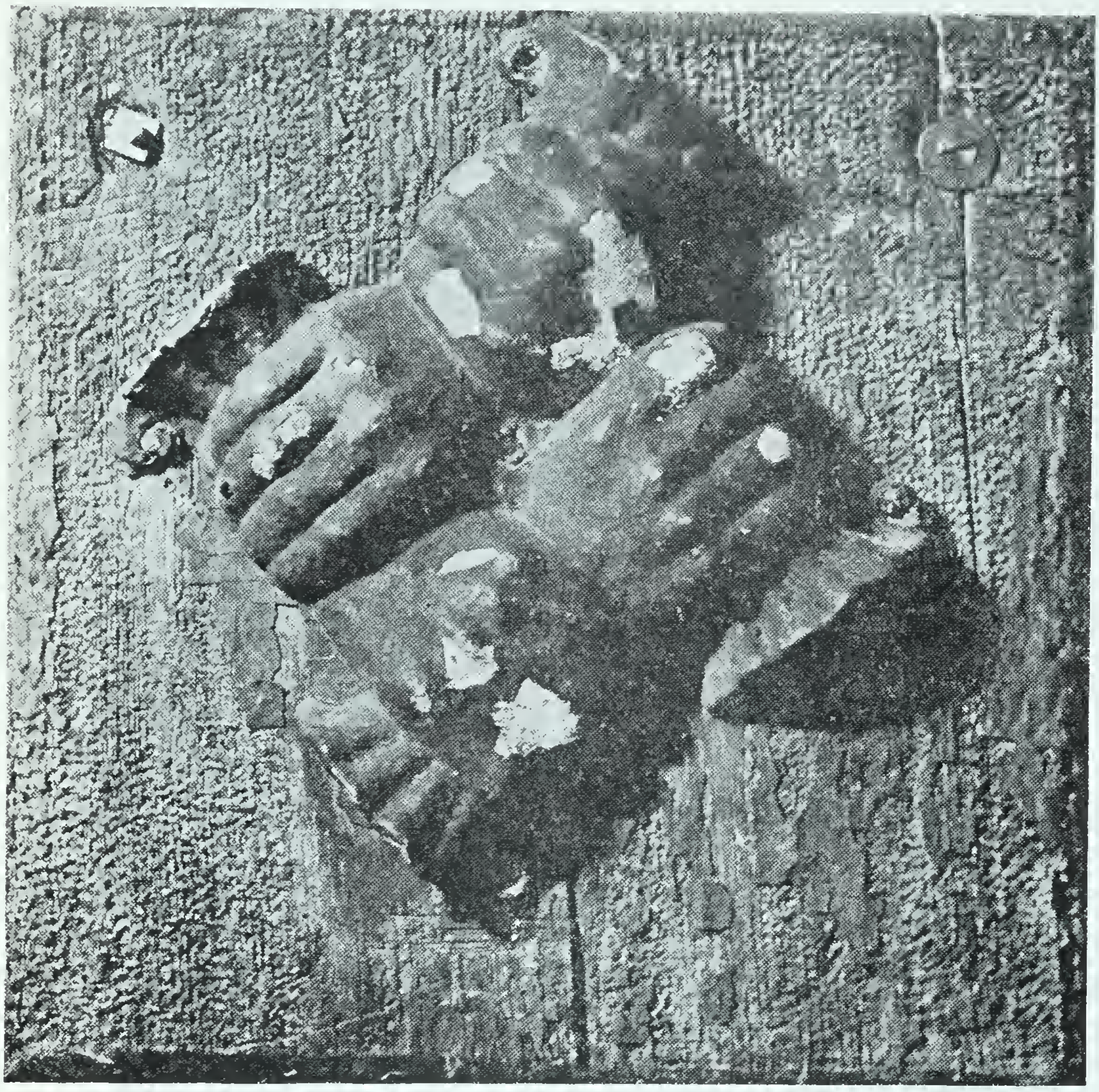
9. 6 is what part of 30?
10. 3 is what part of 15?
11. 4 is what part of 16?
12. 30 is what part of 60?
13. 40 is what part of 100?
14. 18 is what part of 30?
15. 10 is what % of 15?
16. 9 is what % of 45?
17. 6 is what % of 24?
18. 36 is what % of 36?
19. 8 is what % of 32?
20. 6 is what % of 3?

Answers on page 424. If you failed to pass this test, you should study pages 394–402 and do Practice Test 14 A on page 421.


BRACK BROS MFG
CLOSED
NO HELP NEEDED
INSURANCE LIFE
INSURANCE FIRE
INSURANCE AUTO
DOREMUS

UNIT VI

Greater Security



From "American Fire Marks," courtesy Insurance Company of North America

The oldest fire mark in the United States. It was issued in 1752 by the Philadelphia Contributionship for the Insurance of Houses from Loss by Fire. Because of this mark the company became known as the "Hand-in-Hand."

Insurance Is Coöperative Protection against Financial Loss

The discovery of fire is considered one of the great discoveries in the history of civilization. Under proper control, fire has long been a friend and helpmate to man. But out of control, it is one of man's worst enemies. Uncontrolled fire has laid waste thousands of acres of valuable timber, has destroyed factories, mills, ships, offices, and homes, and all too frequently has taken lives.

Coöperative plans for protection against losses caused by fire were put into use many years ago. In the days of the early settlers in our own country, there was little chance of saving a house or a barn once it had started to burn. The financial loss caused by a fire was often too great for the owner to bear, and he was forced to give up his entire property. To prevent such losses, many communities developed a coöperative and neighborly plan for sharing their burdens. Usually the members of the community elected a group of officers who were charged, first, with estimating any property loss by fire and, second, with the proper division of the cost among the neighbors. Thus was the basic idea of modern insurance applied in our pioneer communities. Whenever a group of persons agree to share the financial burdens resulting from disaster to anyone in the group, there is in reality some form of insurance.

As communities grew, the people began to provide some means for putting out fires. During the two or three decades preceding the American Revolution, most larger communities organized volunteer fire brigades. When a fire was reported, the members of the volunteer organization would get to the site of the blazing structure as quickly as possible and try to extinguish the fire. In addition to this somewhat uncertain service, it was also possible to obtain protection against financial loss through organized insurance companies. To indicate that certain property was insured, the company nailed to that person's property a symbol or "fire mark." The first American fire mark consisted of four hands clasped and crossed, as shown in the illustration. When a volunteer fire brigade was called to fight a fire in an insured dwelling, the insurance company whose fire mark was on the property paid the firemen for their work.

The insurance business has grown tremendously throughout the years. From the crude beginning in protecting against loss by fire, the insurance idea has been expanded to apply to almost any kind of risk. And in every instance the basic plan is one of coöperative protection — that is, of using the pooled resources of a group in order to protect each individual against a possible financial loss.

The insurance company of today must predict with a high degree of accuracy the expected losses in each type of risk covered. When a person "buys insurance" of any kind, he pays his share of the amount of the predicted losses for the entire group of persons carrying that kind of insurance. Consequently, any workable method for providing insurance must have behind it some rather careful planning. And the task of planning is a complicated one. Persons who work at this phase of insurance are highly trained specialists called ***actuaries.*** The field of work of these trained specialists may properly be called the ***science of insurance.***

Although the idea of insurance is a good one, it does not follow that every kind of insurance is desirable or that every insurance plan is reliable. Occasionally the probable losses are not accurately estimated in advance or the calculations are based on information that is not comparable. The "buyer" of poorly planned insurance is in for considerable grief.

Here's an example of what can happen when all the essential factors are not carefully considered or the original estimates and calculations are not accurate:

Some years ago, in a certain state, the legislative body passed a law to establish a fund which would guarantee a pension to retired teachers. Each teacher was required to contribute 1% of his or her annual salary to the fund. These contributions were supposed to insure the pension payments as the teachers became eligible. About 20,000 teachers contributed to the fund and all went well for several years. However, the number of teachers contributing and the amount contributed each year were pretty well fixed. And as the number of retirements increased, with a consequent increase in pension payments, a condition was soon reached where more money was being withdrawn from the fund than was being added to it. Finally, there came a time when nothing was left for teachers who had contributed to the fund for upward of 15 to 20 years.

Obviously this particular method for buying insurance was improperly planned. In setting up this scheme, what big mistake did the planners make?

Do you think that your future need for insurance will be greater than the present need of your parents? Perhaps the class would like to take a few minutes to list the many risks, in modern times, to life, physical well-being, and property.

What are some of the misfortunes that might come to you and for which you might like to have the financial assistance that insurance can give?

What are the kinds of insurance a person can buy?

How much does insurance cost?

How is the cost determined?

How much insurance should a person buy?

Most of these questions are those that a person buying insurance needs to answer.

PROBLEM I

How Is Property Protected by Insurance?

Almost every kind of risk to real estate and personal possessions may be insured with one or another of the various insurance companies. Crops may be insured against damage by rain, hail, fire, or wind; houses and other buildings may be insured against all kinds of damage, including airplane crashes; and personal possessions (such as your stamp collection) may be insured against theft and damage.

Some insurance companies will insure against many kinds of risks, whereas others specialize in particular risks. There are accident and liability insurance companies, casualty insurance companies, fire insurance companies, automobile insurance companies, marine insurance companies, and life insurance companies. Many of these companies started with a special type of insurance but have since branched out to include numerous other kinds.

Property may be insured against damage and loss.

Many persons buy insurance to protect against the common hazards to property. You may be surprised at the many types of risks covered in your own community. Here is an example of what might take place:

Alice Dale's mother was sitting near the window, watching a hailstorm which was destroying most of their wheat crop. Mrs. Dale thought it a pity that the storm had come just as the wheat was ripe. In two weeks the crop would have been harvested and the golden grain stored in bins. Mr. Dale tried to console his wife by reminding her that he had had the foresight to "take out" hailstorm insurance, which would repay him in part for his loss. But Alice was puzzled by her father's statement; so she asked him, "What do you mean by hailstorm insurance?"

Mr. Dale said, "It's much like any other kind of property insurance. I make a payment, called a ***premium***, to the insurance company; then, if our crop is partly or completely destroyed by hail, the company pays us an amount equal to our estimated loss unless the loss is greater than the amount stipulated in the original contract with the insurance company. Usually the total amount payable is somewhat less than the probable total value of the crop."

"What happens to your premium money if your crop is not damaged?" Alice asked.

"The insurance company uses part of it to help pay expenses and puts the remainder in a fund that is maintained to pay farmers who do have losses," Mr. Dale told her. "It is because of this fund that the insurance company can afford now to pay me up to $3000 for the damage to my wheat crop although my premium payment to them was only $37.50."

Questions to Discuss and Things to Do

1. Mrs. Mack insured her baggage worth $300 against loss or damage for 10 days. What premium did she pay at the rate of 4 cents per day for each $100?

2. For baggage valued at more than $1000 the rate on all above $1000 is 70% of the rate on the first $1000. Mrs. Pitts insured her family's baggage for $3600 for 2 months to cover a trip home from Argentina. The rate on the first $1000 was 60 cents per $100 per month. What was her total premium?

3. The People's National Bank insures the loans it makes through its small-loan department. If a borrower dies, the loan is canceled and the bank collects from the insurance company the amount still due. The rate is $1 per month per $1000 of insured loans. If the People's National Bank had an average of $123,000 per month in insured loans last year, how much did it pay for this protection for the entire year?

4. The Central Manufacturing Company carries insurance against loss from damage caused by riot and civil commotion. The yearly rate is 24 cents per $100. If the property is insured for 80% of its value, a reduction of 25% is allowed in this rate, and if it is insured for 100% of its value, a $33\frac{1}{3}$% reduction is allowed. What yearly premiums would be paid under these conditions if property valued at $120,000 was insured for $\frac{1}{2}$ its value? if it was insured for 100% of its value?

5. Frequently buildings are equipped with automatic water sprinklers. The heat of a fire melts the plugs and starts the sprinkling operation. But there is always a possibility that the water will start to flow at the wrong time, with the result that much damage may be done to goods. In one storage room containing furs, the damage from accidental sprinkler leakage was estimated at $28,000. The storage company had $30,000 worth of furs in storage, and had insurance protection up to 80% of the value of the furs in storage. What was the actual monetary loss to the storage company from the sprinkler damage? (Neglect cost of insurance premiums.)

6. Mr. Black lives in a section frequently subjected to damage by hurricane. He must pay for windstorm insurance at the rate of $2.50 per $100. How much insurance protection can he buy for $25 a year?

7. The Midland Chemical Company carries explosion insurance on its plant. The rate is 85 cents per $100 if the property is insured for 50% of its value. At this rate what premium does the company pay on its plant, which is valued at $250,000? If the plant is insured for 80% of its value, a reduction of 30% in the 85-cent rate is allowed. At this lower rate the annual premium would be _?_.

8. Mr. Mason lives in a section that has occasionally been damaged by earthquakes. Accordingly, he carries earthquake insurance on his $5400 home. His policy has the usual provision which requires that his property has to be damaged more than 5% of its value, or _?_ dollars, before he can collect from the insurance company.

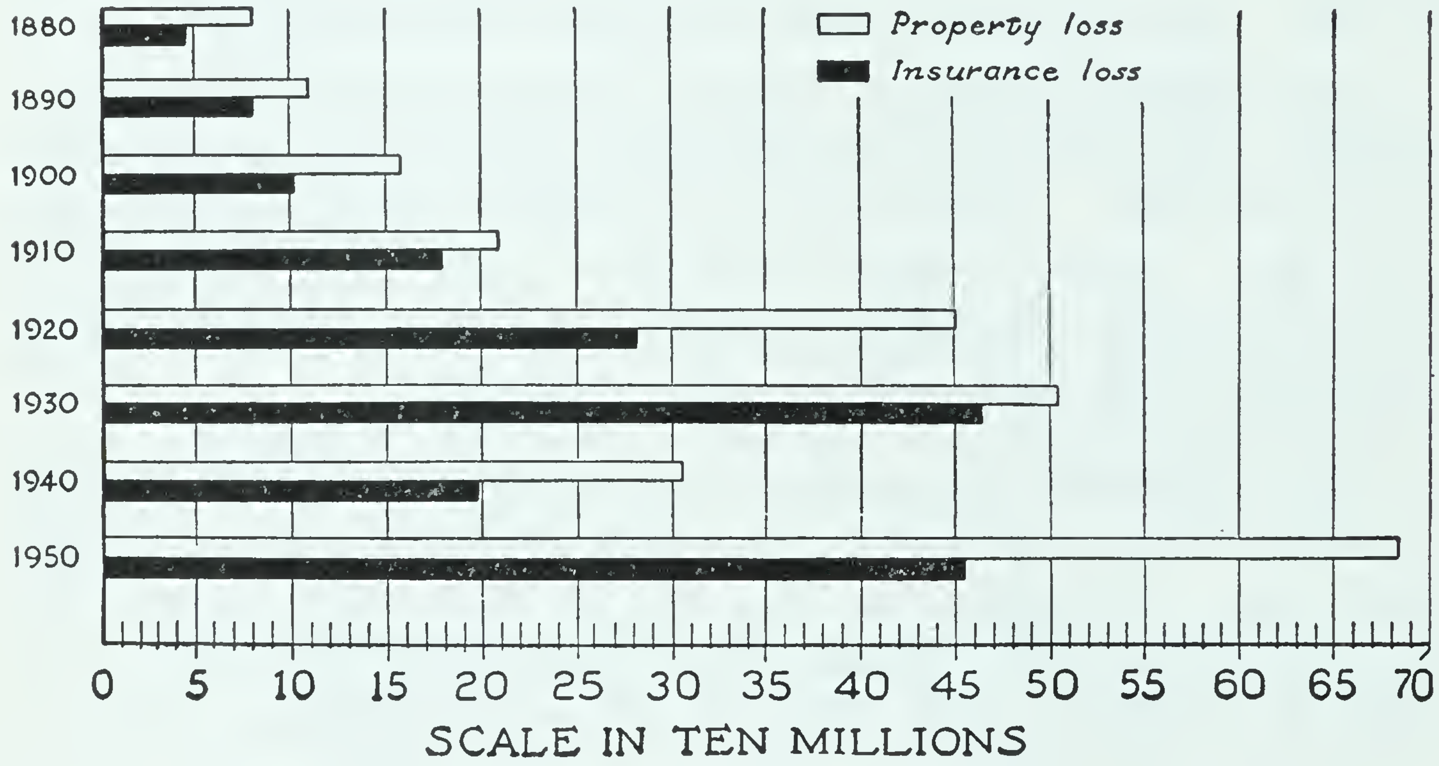
Special investigation

9. (*a*) Let each member of the class write on the blackboard one kind of risk to property that is covered by insurance in the homes represented by the students.
   (*b*) Let each member try to think of some risk to property for which he or she might like the security that insurance can give. (In this step give your imagination full play. For example, you may have an aquarium and wish to insure your valuable tropical fish.)
   (*c*) Find out how many different kinds of property insurance are available in your community.

Fire insurance is a common type of property insurance.

You have learned in the introduction to this unit how early American property owners attempted to obtain protection against losses by fire. Large numbers of modern property owners seek similar but better protection through fire insurance. Here is a graph showing the monetary value of property that is damaged by fire and the amount of insurance held on this property. The graph shows single-year losses at 10-year intervals, beginning in 1880. Perhaps this will give you some idea of the vast amount of damage done by fire.

PROPERTY AND INSURANCE LOSSES BY FIRE



Questions to Discuss and Things to Do

1. Can you give any reasons why property losses from fire increased from 1880 to 1930?

2. Can you give any explanation of why property losses dropped so greatly in 1940 as compared with 1920 and 1930?

3. How has the insurance loss compared with property loss in the years pictured by the graph?

4. Try to get the data on insurance and property losses for each year from 1950 to date and construct a graph like the one shown.

Location and construction determine fire rates on buildings.

When a person pays the premium on a fire insurance policy, his money is used for three purposes: (1) to pay the claims on current losses, (2) to pay the running expenses of the company, and (3) to create a reserve fund which may be used in case of a large fire such as the San Francisco fire of 1906, which cost the insurance companies $225,000,000. Until near the last quarter of the nineteenth century, fire departments were almost entirely voluntary, and large city fires were likely to be disastrous to insurance companies. A number of the older companies failed to establish a reserve fund large enough for a big fire, and were forced into bankruptcy by either the Pittsburgh fire of 1845 or the Chicago fire of 1871.

The amount of the premium for fire insurance varies with the risk involved. On a frame house the premium is higher than on a brick one. On country property which is not near fire departments the rates are higher than on property located in towns and cities with good fire departments.

On this page is a table which gives fire insurance rates on several classes of buildings in different locations. Notice how the rates vary. Community A is a town with a good fire department. Community B is a rural section with no organized fire protection.

ONE-YEAR FIRE INSURANCE RATES PER $100 OF INSURANCE

CLASS OF BUILDING	COMMUNITY A		COMMUNITY B	
	BUILDING	CONTENTS	BUILDING	CONTENTS
Brick dwelling with approved roof	$.12	$.12	$.26	$.26
Brick dwelling with unapproved roof	.18	.18	.34	.34
Frame dwelling with approved roof	.16	.16	.30	.30
Frame dwelling with unapproved roof	.22	.22	.38	.38
Hotel	.74	1.14	1.23	1.78
Public garage	1.60	2.06	2.03	2.61
Department store	.65	1.04	—	—
Warehouse	1.01	1.65	1.83	2.13

Questions to Discuss and Problems to Solve

Use the table on the preceding page to solve these problems. The rate for a 3-year policy is $2\frac{1}{2}$ times the 1-year rate, and for a 5-year policy the rate is 4 times the 1-year rate.

1. Find the cost of a 3-year policy on the following properties:

(*a*) A hotel insured for $17,000 in Community A.

(*b*) A frame dwelling with approved roof insured for $4500 in Community B.

(*c*) A public garage insured in Community B for $8000.

(*d*) Furniture insured for $1500 in a brick building with approved roof in Community B.

(*e*) Equipment insured for $38,000 in a public garage in Community A.

(*f*) Goods insured for $23,000 stored in a warehouse in Community A.

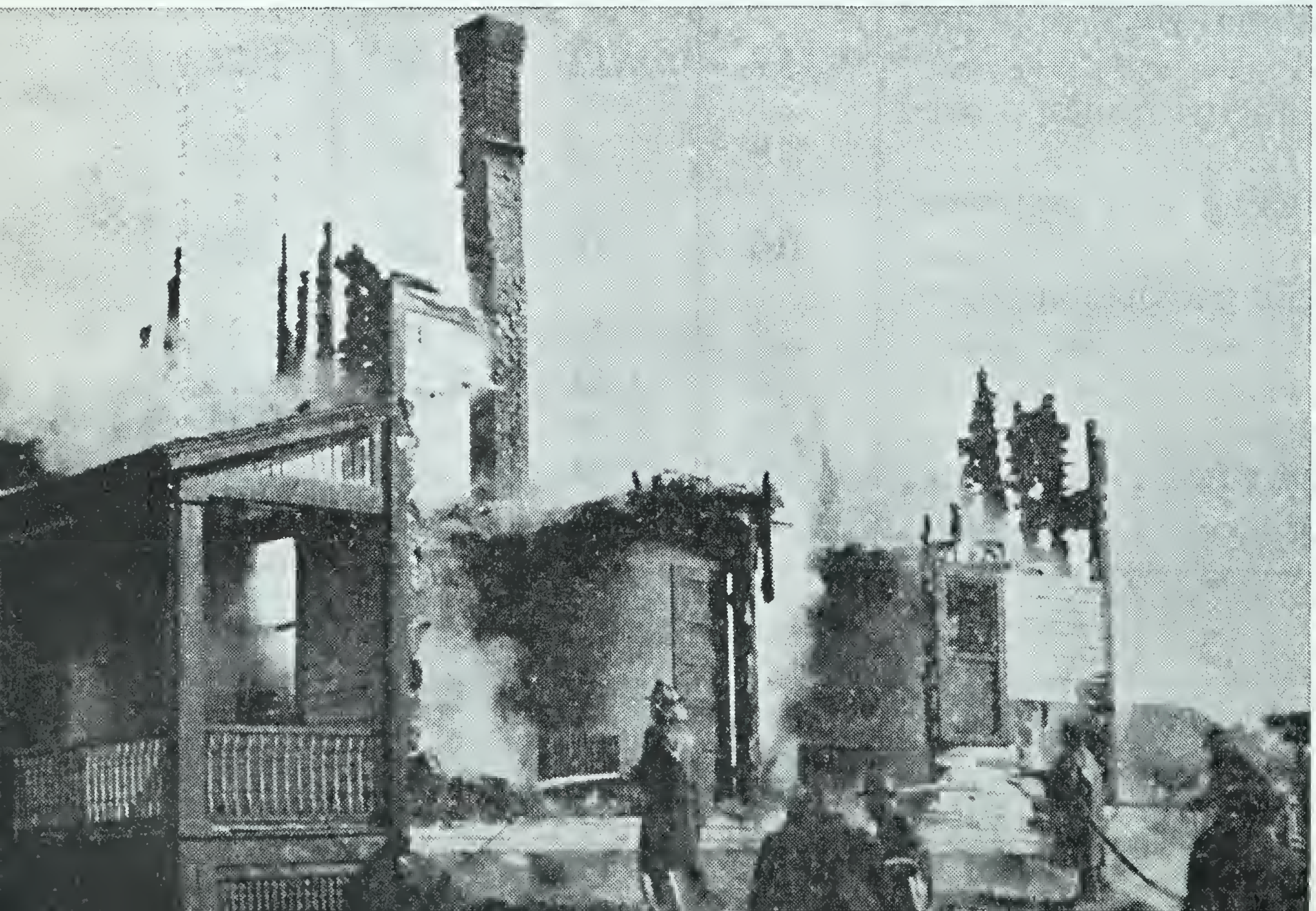
2. Mr. Hull, who lives in Community A, has replaced the wooden shingles on his roof with fireproof asbestos shingles. If his house is insured for $6000 and his furniture for $1500, how much will he save on a 1-year policy by putting on the new, approved roof?

3. Mrs. Watson has her hotel property in Commumty B insured for $12,000. How much cheaper is her insurance for 3 years if bought by the 3-year rate than if bought by the 1-year rate?

4. The Everyman's Department Store has insured its warehouse in Community A for 15 years at the 3-year rate. How much would the owners have saved in terms of 1-year premium if they had used the 5-year rate? (Compare annual premiums.)

Here is a dramatic illustration of the reason for high fire insurance rates on frame dwellings in outlying areas.

Philip Gendreau



5. The Wearever Cotton Mills Company is considering building a new warehouse. Assume that it will insure the building for $5300 at the 5-year rate. How much cheaper will its fire insurance be each year with the warehouse located in Community A than with the warehouse in Community B?

6. A house worth $8500 is insured for 80% of its value. If it is burned to the ground, the owner will receive $_?_ less than $8500.

7. Mr. Dewey has his house insured with Company X for $3000 and with Company Y for $2000.

(*a*) This means that Company X will pay $\frac{3}{5}$ and Company Y will pay _?_ of any loss up to $5000.

(*b*) If his house is damaged by fire to the extent of $3000, Mr. Dewey will collect _?_ from Company X and _?_ from Company Y.

8. When property is only partly insured, what loss may result from fire? Assume that —

Mrs. Anderson's home and furniture are valued at $10,000.

The property is insured for 75% of its value and has been covered successively by 3-year policies for 15 years.

The 1-year insurance rate is 20 cents per $100.

SOLUTION. (*a*) When the property was completely burned during the fifteenth year, the owner collected _?_ from the insurance company.

(*b*) Twenty-five per cent of $10,000, or _?_, was lost because the property was not fully insured.

(*c*) The owner's total loss, counting premiums, was _?_ dollars.

Special investigations

9. How do fire insurance rates vary in your community? Select five pieces of property in your community and find out the fire insurance rate on each. Make your selections in different sections of the community and from different kinds of property. Any local fire insurance agent will give you the rates you want. Prepare a report for your class which will answer the question of the investigation.

10.* You may wish to investigate a recent fire in your community to find out what insurance was carried, what settlement was made, and the steps involved in making the settlement.

Short-term fire insurance rates are high.

It is frequently necessary to buy fire insurance for less than a year. For example, when a dealer has goods in storage for a few days or months, he may wish to carry fire insurance. Also, when a building is to change hands shortly after the expiration of a long-term policy, the owner may wish to have a short-term extension. Many insurance companies follow the schedule of short-term rates given in the following table:

1 Day	5% annual prem.	50 Days	24% annual prem.
2 Days	6% annual prem.	55 Days	26% annual prem.
3 Days	7% annual prem.	60 Days	27% annual prem.
4 Days	7% annual prem.	65 Days	28% annual prem.
5 Days	8% annual prem.	70 Days	30% annual prem.
6 Days	8% annual prem.	75 Days	31% annual prem.
7 Days	9% annual prem.	80 Days	32% annual prem.
8 Days	9% annual prem.	85 Days	34% annual prem.
9 Days	10% annual prem.	90 Days or 3 mo.	35% annual prem.
10 Days	10% annual prem.	105 Days	39% annual prem.
11 Days	11% annual prem.	120 Days or 4 mo.	43% annual prem.
12 Days	11% annual prem.	135 Days	47% annual prem.
13 Days	12% annual prem.	150 Days or 5 mo.	52% annual prem.
14 Days	12% annual prem.	165 Days	56% annual prem.
15 Days	13% annual prem.	180 Days or 6 mo.	60% annual prem.
16 Days	13% annual prem.	195 Days	63% annual prem.
17 Days	14% annual prem.	210 Days or 7 mo.	67% annual prem.
18 Days	14% annual prem.	225 Days	70% annual prem.
19 Days	15% annual prem.	240 Days or 8 mo.	73% annual prem.
20 Days	15% annual prem.	255 Days	76% annual prem.
25 Days	17% annual prem.	270 Days or 9 mo.	80% annual prem.
30 Days	19% annual prem.	285 Days	83% annual prem.
35 Days	20% annual prem.	300 Days or 10 mo.	86% annual prem.
40 Days	21% annual prem.	315 Days	90% annual prem.
45 Days	23% annual prem.	330 Days or 11 mo.	93% annual prem.
360 Days or 12 mo.	100% annual prem.		

Problems to Solve

Use the short-term rate table to find the premiums on the following policies: (Fractional parts of a cent are taken as whole cent.)

1. A $12,000 policy for 30 days on a dwelling at annual rate of 12 cents per $100.

2. A $10,000 policy for 65 days on a dwelling at annual rate of 18 cents per $100.

3. A $150,000 policy for 6 months on a hotel at annual rate of 74 cents per $100.

4. A $75,000 policy for 120 days on the contents of a department store at annual rate of $1.04 per $100.

5. A $315,500 policy for 10 days on the contents of a warehouse at annual rate of $1.65 per $100.

6. A $15,750 policy for 90 days on the contents of a warehouse at annual rate of $1.83 per $100.

7. A $23,600 policy for 17 days on the contents of a public garage at annual rate of $2.06 per $100.

8. A $15,750 policy for 30 days on the contents of a public garage at annual rate of $2.61 per $100.

9. A $21,750 policy for 5 days on goods in transit at annual rate of $1.03 per $100.

10. A $1550 policy for 8 days on goods in transit at annual rate of $1.15 per $100.

Fire insurance policies may be canceled at any time.

Right is reserved in a fire insurance policy for either the insured or the company to discontinue the insurance at any time. For example, if a home owner sells his house he may discontinue his fire insurance (or he may transfer it to the new owner with the permission of the insurance company). What are some reasons why the company might desire to cancel a policy?

When the insurance company cancels the insurance, the unused part of the premium is returned to the insured. If Mr. Mason paid $27.30 on a 3-year policy and the company canceled the policy at the end of 1 year, the company would pay back $\frac{2}{3}$ × $27.30, or _?_. If the company canceled the policy at the end of a year and a half, the company would return $\frac{1}{2}$ × $27.30, or _?_.

When the policyholder cancels a 1-year policy, the portion of the premium retained by the company is determined according to the short-term rate table on page 304. For example, on a 1-year policy canceled by the policyholder after 70 days, the company would retain 30% of the premium and return 70%. Other rate tables are used for cancellations of 3-year and 5-year policies.

Problems to Solve

1. Compute the amount of premium returned by the company in the following cancellations by the company:

(*a*) A 2-year policy on which the premium was $15.60, canceled at the end of 1 year.
(*b*) A 3-year policy on which the premium was $132.50, canceled at the end of 2 years; at the end of 18 months.
(*c*) A 5-year policy on which the premium was $87.35, canceled at the end of 4 years; at the end of 2 years.
(*d*) A 1-year policy on which the premium was $48.32, canceled at the end of 9 months; at the end of 4 months.
(*e*) A 5-year policy on which the premium was $112.80, canceled at the end of 15 months; at the end of 3 years and 9 months.

2. Mr. Taylor bought $12,500 of fire insurance for 6 months on stored dry goods. The rate was $1.12 per $100. At the end of 3 months he sold the goods and canceled the insurance. How much refund did he get from the insurance company?

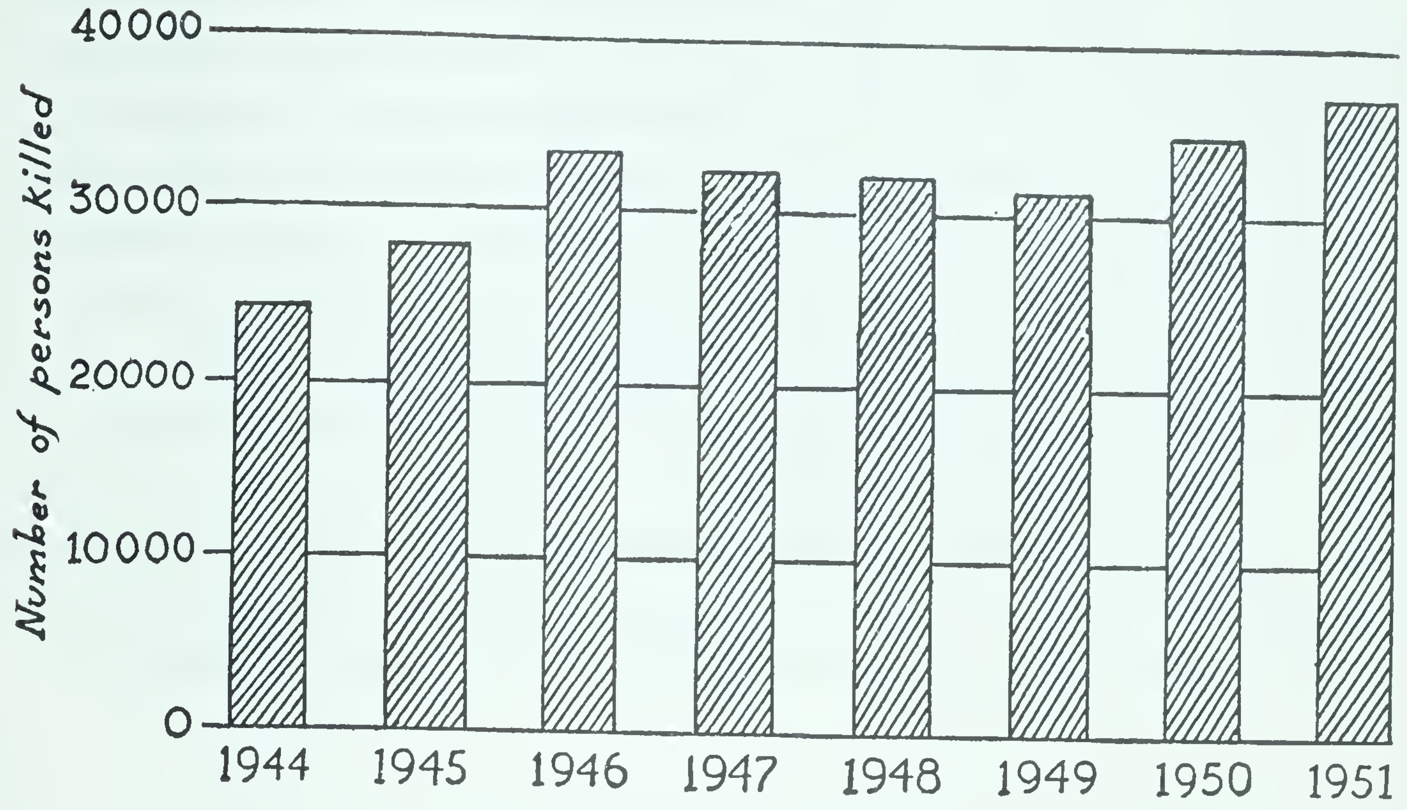
3. Mrs. Miller had her household goods insured for $4200 at the rate of 35 cents per $100 for 1 year. At the end of 9 months she moved to another town. She decided to insure in the new town with another company. How much refund did she get from the first company?

4. How much would a company return on a policy canceled by the policyholder after 30 days on a 1-year premium of $80.20? after 3 months? after 4 months?

5. A company retains 52.8% of the premium on a 3-year policy if the policyholder cancels the policy at the end of 18 months. How much would the company return if the premium was $183?

6. Mr. Kemp had his home insured for $8000. The 1-year rate was 30 cents per $100, but Mr. Kemp took advantage of the reduced rate on a 3-year policy. After he had held his policy for 12 months, the company reduced the 1-year rate on his type of property to 20 cents per $100. He could cancel his old policy and the company would refund 63% of the premium. He could then insure for the remaining 2 years at the 20-cent rate. Would he save by this change? If so, how much? (Remember that a 3-year rate is $2\frac{1}{2}$ times the 1-year rate.)

Motor Vehicle Deaths



Source: National Safety Council

PROBLEM II

What Kinds of Automobile Insurance Are Available?

Nearly everyone knows that the automobile is normally one of the most common hazards to the safety of life, limb, and property of the individual citizen. The number of deaths from highway accidents increased rapidly between 1944 and 1946, although many attempts were made to reduce such accidents. From 1946 to 1949 there was a gradual drop in the number of highway accidents. In 1950, however, the trend turned upward once more. The accompanying graph pictures the trend of deaths caused by motor vehicles from 1944 to 1951.

Do you remember at least two things that happened in 1945 which would account for the increase pictured in this graph? Can you think of a possible reason for the drop from 1946 to 1949? Many insurance companies increased their rates on automobile insurance during 1946. How does this graph show that such increase was necessary? Does the graph suggest that rates on automobile insurance needed to be increased in 1951?

Persons who buy automobile insurance do not all purchase the same protection. Usually, though, automobile insurance covers any one or all of the following risks, which may be covered by a single policy or by several policies: (1) of having your car burn partially or completely — *fire* insurance; (2) of having it or any part stolen — *theft* insurance; (3) of having it damaged by collision or otherwise — *collision sustained* insurance; (4) of doing damage to someone else's car or property — *property damage* insurance; or (5) of injuring a person with your car — *public liability* insurance (which may include medical payments for injury to the driver or to passengers). If these terms are not altogether clear to you, the following problems will help you. By solving these problems you will come to understand better the specific provisions of automobile insurance covering the five types of risks.

Problems to Solve and Things to Do[1]

1. Mr. Jackson has been driving a car for the past 20 years. His insurance premiums for fire, theft, and collision sustained averaged $72 per year. He has had one accident, for which he was repaid to the extent of $275.00. How much more has he paid out than he received in paid claims?

2. One insurance counselor claims that collision sustained insurance is not to be recommended. He gives as one reason for his claim that the premiums are high. Can you think of other reasons to support his claim? What reasons may be given to refute his claim?

3. One automobile insurance company allows three discounts on its basic premiums for property damage and public liability insurance. The first discount of 20% is allowed a car owner who does not use his car in his business. An additional discount of 5% on the basic premium is allowed if certain conditions concerning distances driven and drivers of the car are met. If at the end of a year of insurance no accidents have occurred, the owner is entitled to a rebate equal to 15% of the premium he actually paid. The first item in this table shows you how these discounts work. Compute the values for the remainder of the table in a similar manner. (Drop fractions of a cent.)

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[1] To the Teacher. Here an investigation will be helpful. We suggest that the class select about ten typical cars, and record the make, model, and year of each. Take this list to a local agent for an automobile insurance company. Ask him to give you the premiums the company would charge for fire, theft, collision sustained, property damage, and public liability insurance for each of these cars. Present this information in a chart for your bulletin board. Better still, it may be possible to borrow a rate book and have a small committee make the chart for all the family cars in the class. If the class isn't too small, the total cost per year for reasonable protection will be startling.

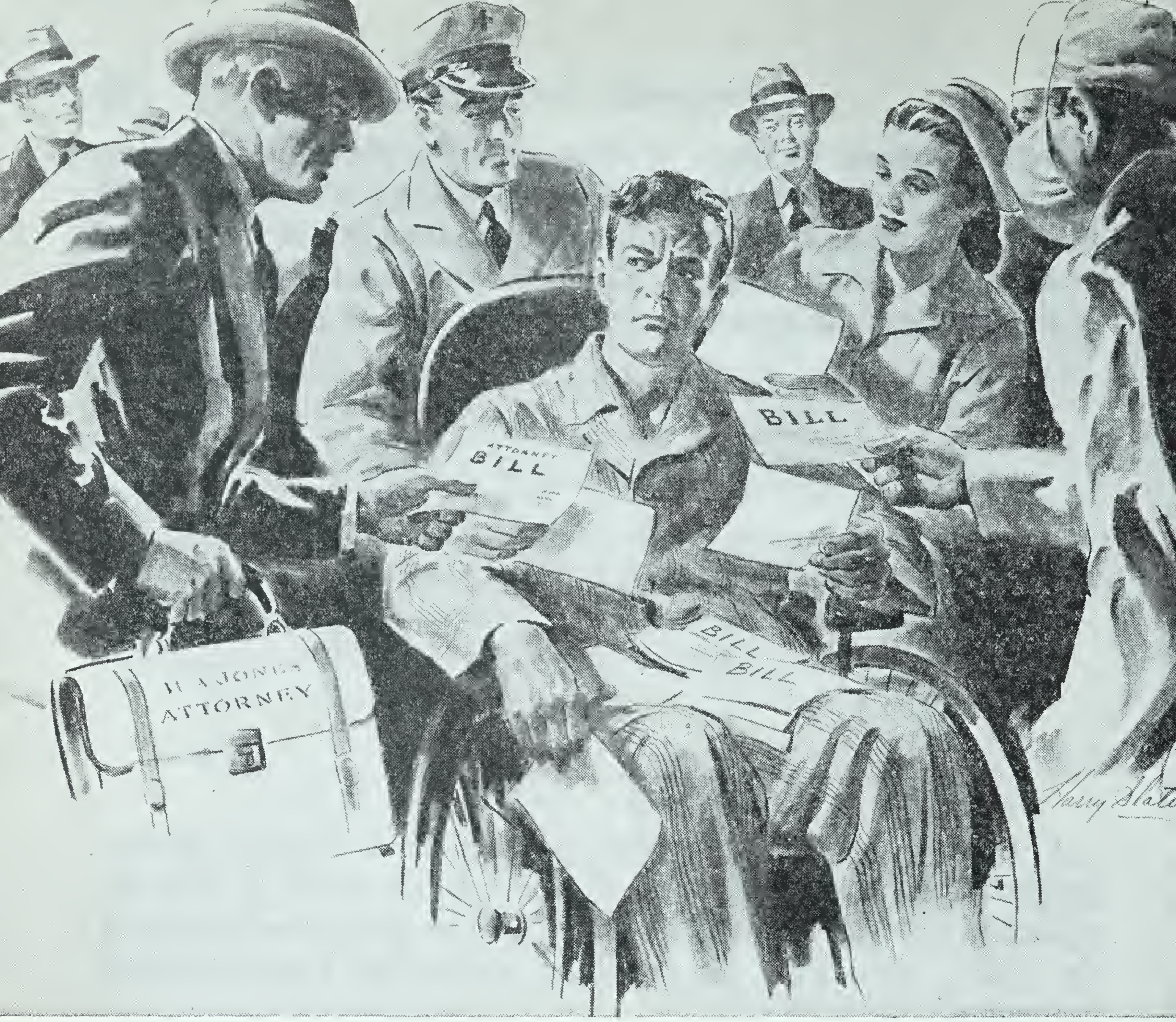
RATE A BASIC PREMIUM	RATE B 20% DISCOUNT	RATE C 25% DISCOUNT	15% SAFE DRIVER REBATE		
			BASED ON RATE A	BASED ON RATE B	BASED ON RATE C
$62.00	$49.60	$46.50	$9.30	$7.44	$6.98
48.00					
56.00					
70.00					
45.00					
60.00					

4. Below is given the premium rate for $5000 property damage insurance. Certain percentages of this rate are taken to find the premiums for higher limits of insurance. These percentages appear in the table. Find what the premiums are for the higher limits of insurance.

AMOUNT OF PROPERTY DAMAGE INSURANCE	PERCENTAGE OF $5000 RATE	AMOUNT OF PREMIUM
$5,000	100	$12.80
10,000	110	
25,000	120	
50,000	125	
100,000	130	

5. Mr. Allison's collision insurance costs $41 a year, and his property damage and public liability insurance costs $30.00. Over a period of 10 years his automobile insurance will cost ?.

6. Mr. Adams paid $40.81 for his automobile insurance in 1952. In 1953 his premium was increased to $45.20. What per cent increase did this represent?



Fidelity and Casualty Company of New York

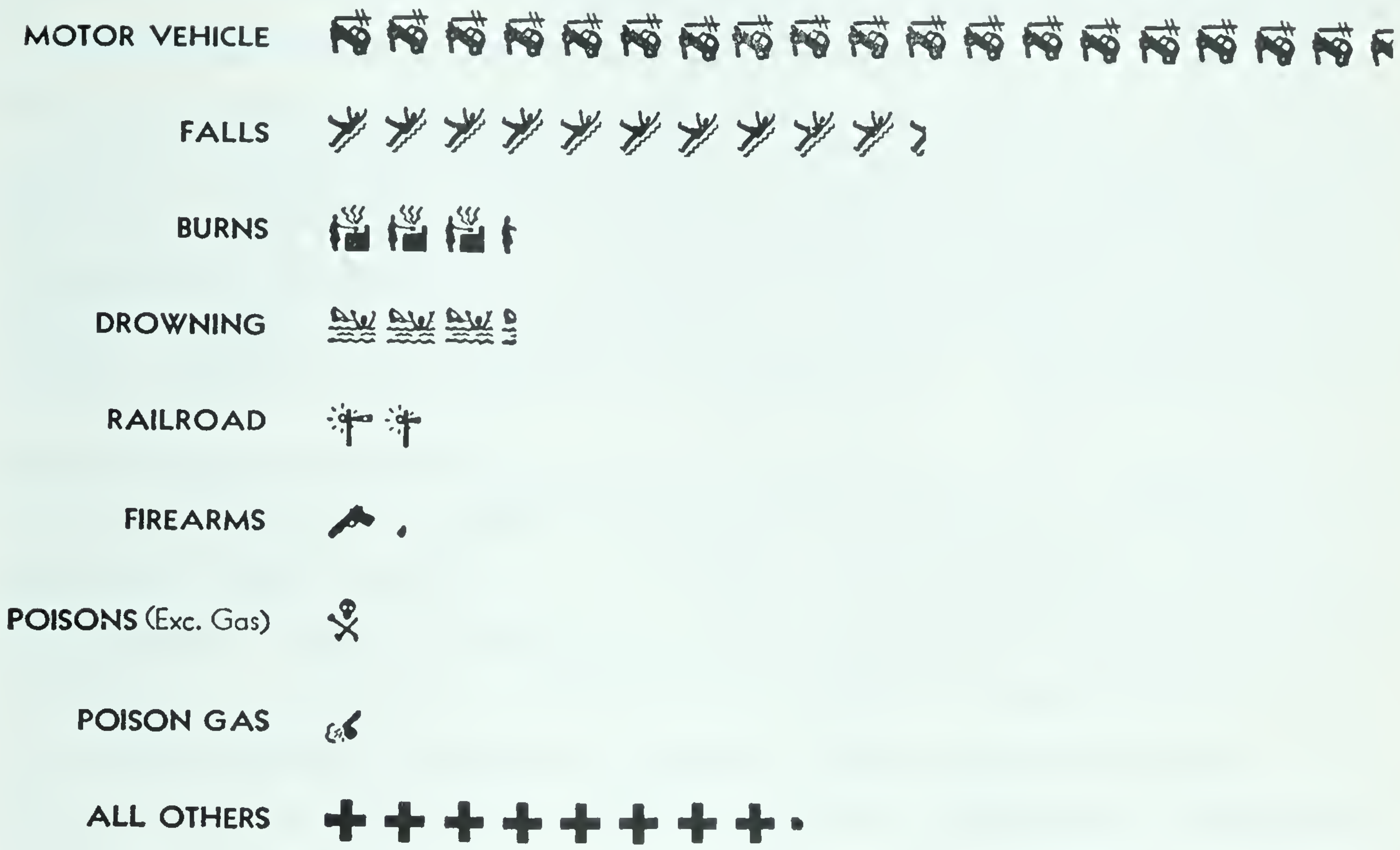
Health insurance and accident insurance do not stop bills from coming in, but such insurance can greatly reduce the burden of paying those bills.

PROBLEM III

What Protection Is Given by Health and Accident Insurance?

One of the threats to the well-being of a family is the possibility of an accident or of failing health of the breadwinner. How many persons are injured each year by accidents other than those caused by the automobile? What types are the most common? What is the amount of wages lost each year by laborers as a result of illness? Pamphlets on safety education provide answers that are startling. The graph at the top of the opposite page presents an alarming picture of accidental deaths in one year in the United States.

ACCIDENTAL DEATHS IN THE UNITED STATES, 1951



Source: National Safety Council Estimates

Each symbol represents 2000 deaths.

Here is a general idea of what is meant by health and accident insurance. About how many deaths were due to motor vehicles?

Health insurance guarantees the insured an income during any illness that keeps him from his work. It may also provide some help with such hospitalization costs as are incurred by the illness.

Accident insurance makes about the same provisions as health insurance, except that benefits are paid only when the disability of the insured results from accidental causes. A special type of accident insurance provides protection for personal assets, such as a violinist's hands, a singer's voice, or a pitcher's arm.

Hospitalization insurance is also a kind of health insurance. It provides for financial help in paying hospital bills in case hospitalization is needed for any cause. *Medical-surgical care insurance* is another kind of health-hospitalization insurance. Fees for medical and surgical services received while in a hospital are paid in whole or in part for holders of this kind of insurance.

For further understanding of health and accident insurance you will need to study questions like the following:[1]

What is a common form of policy covering accident and health? What kinds of policies are sold? How long after a person becomes disabled must he wait before receiving benefit payments? For how long will the company continue payments? In case disability requires hospital care, what help will the policyholder receive from the company on his hospital bills? What rates are charged for an accident benefit of $100 per month? What effect does occupation of policyholder have on rates? Do the policies make any provision for special types of disabilities, such as loss of eyesight? What provision, if any, is made for partial disability? What are the trends with respect to hospital insurance? Is insurance covering medical care likely to increase in the future? What is the difference between a cancelable policy and a non-cancelable? between a renewable policy and a non-renewable? Is a policy covering health and accident good when you ride in an airplane? Is it good when the policyholder goes to war?

Questions to Discuss and Problems to Solve

The following problems will give you a practical insight into the way health and accident insurance operates.

1. Mr. Carr carries health and accident insurance as a special feature added to his life insurance. For this feature he pays $4.74 for each $1000 of his $3000 of life insurance. At this rate what will his health and accident insurance cost him over a period of 35 years?

2. According to Mr. Carr's policy the insurance company guarantees to pay him $10 per month for the first 5 years of total disability. This increases to $15 per month after 5 years and to $20 per month at the end of 10 years. How much can Mr. Carr collect from the insurance company if he becomes totally disabled at age 50 and continues to be disabled for 20 years?

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[1] To the Teacher. One of the most convenient sources is the local agent of a company that sells accident and health insurance. If it is inconvenient or undesirable to have him come to class for a conference, he will almost certainly be eager to provide pamphlets that answer most of the questions that students wish to have answered. If no local agent is available, the questions can be sent directly to a company's headquarters.

3. Mr. Carr's life insurance premium of $74.26 per year is not required if he becomes eligible for disability payments. How much will he save in premiums if he is disabled for 20 years?

4. A health and accident insurance policy which starts payments of $100 per month with the first day of disability costs $73.20 annually. By starting the payments after disability has existed for 3 months the annual premium is reduced to $29.28. How much less is the total cost of the second policy than that of the first over a period of 40 years?

5. Mrs. Best has a health and accident policy from which she has received $50 per month for 2 years of total disability. She also received one half this amount per month for partial disability that lasted 3 months. What is the total amount she has collected in benefits?

6. Mrs. Bond's policy guarantees $100 a month for the first 30 months of total disability and $50 a month for the next 60 months. What are the maximum benefits possible? She has had the policy for 18 years. The annual premium was $62.70. Her premiums have been _?_ less than the maximum benefits possible.

7. The Middletown Health and Accident Company increases its premiums 15% at age 60 on renewable policies. A policy that costs $86.40 before age 60 will cost _?_ after age 60.

8. Mr. Jones has an accident policy which guarantees $12.50 a week for the first 200 weeks of permanent disability. If at the end of that time permanent disability continued, Mr. Jones would be paid in one sum the equivalent of 600 weeks of benefit. What is the total amount collectible with this policy?

9. The rate which Donald Boyer pays for his hospitalization and medical-surgical insurance is $1.70 monthly. What will this insurance cost Donald over a period of 10 years?

10. The Coulter family carry hospitalization insurance at the family rate of $2 a month. Recently Mrs. Coulter was taken ill with pneumonia and had to be hospitalized. The insurance company paid $106 toward the hospital bill. How long will the Coulters have to carry this policy before they have paid $106 to the company in premiums?

PROBLEM IV

What Does the Social Security Law Provide?

If you have worked summers or part time for some organized business firm, you should already have a ***social security number***. In any case, you should apply for a number as soon as you begin work in private industry or commerce. This number identifies your personal account with the *Social Security Administration* in Washington, D. C., and you will receive a ***social security card*** with this number on it. Important amendments have been made to the *Social Security Act* since it was first signed by the President on August 14, 1935, and additional amendments may be expected. But its fundamental function remains the same — greater security for a greater number of citizens.

The purposes of the Social Security Act are to feed, clothe, and shelter the helpless and destitute in a humane manner; to establish a minimum economic standard; and to increase the purchasing power of the people. This does not mean that the act guarantees a living wage to everyone. It does, however, mean that unemployed, aged, dependent, and disabled persons will have some sort of income.

To accomplish its purposes, the Social Security Act provides for ten specific programs. But the similarity in some of these programs permits a consolidation into three distinct groups, as follows:

(*a*) Social Insurance
   1. Employment security, including public employment service and unemployment insurance
   2. Old-Age and Survivors Insurance

(*b*) Public Assistance to the Needy
   1. Old-age assistance
   2. Aid to the needy blind
   3. Aid to dependent children

(*c*) Health and Welfare Services
   1. Child-welfare services
   2. Services for crippled children
   3. Maternal health services
   4. Child health services
   5. Retraining for disabled workers

The first of these groups is strictly concerned with insurance, whereas the other two may be considered to be essentially welfare groups. We shall confine our treatment to the two programs in the Social Insurance group.

Employment security is a joint endeavor of state and Federal governments.

The Social Security Act does not require states to provide unemployment insurance. However, the states are encouraged to provide it, and every state now has some form of unemployment insurance program. The Federal government pays the expenses of collecting and distributing the benefits for any state with an approved program. But the job of providing unemployment insurance is left entirely to the state, and no two state programs are exactly alike in their administration.

In every state, weekly payments are made to persons out of a job, provided they have been employed in covered employment. (Workers in Federal, state, or local government services and certain other workers are not covered by the original law.) Most states also make payments for partial unemployment; that is, for part-time employment because of slack periods of production. Furthermore, in most states no benefits are paid to the worker who quits his job voluntarily, who is discharged for misconduct, who refuses to accept a suitable job, or who is out of work because of a labor dispute. Payments in the different states vary as to amounts and as to number of weeks payable. In 1951, employer contributions to state unemployment insurance funds averaged 1.6 per cent of wages and the Federal government collected 0.3% from employers on only the first $3000 of each individual annual wage.

Another feature of this program is the system of nation-wide public employment offices. These offices are ready to help anyone obtain a job. They are operated by the Federal government through the United States Employment Service.

At the same time that a person registers with the Employment Office for a job, he may make a claim for unemployment insurance benefits.

Perhaps you would like to find out more about the Employment Security program in your state. Write to your state capital for a copy of the latest report on unemployment compensation. Find out what division of your state government handles the Employment Security program. Here are some of the questions for which you might like to find answers:

(1) What employers are included?

(2) What kinds of jobs are excluded?

(3) At what rate are unemployment benefits paid? For how long are such benefits paid?

(4) How long must a person be unemployed before he gets unemployment benefits?

(5) What important changes have recently been made in social security provisions?

Problems to Solve

1. When John Andrews was laid off, he applied for a benefit allowance from his state unemployment commission. He was declared eligible and told that he would receive $\frac{1}{2}$ of his regular weekly wages, or $22 weekly, whichever was the smaller; and this amount would be paid for not more than 16 weeks. How much did John receive during the 5 weeks before he got a new job if his regular wage on his previous job was $56 a week?

2. In Henry Allison's state a person may receive benefit for partial unemployment equal to $\frac{1}{2}$ of his regular wages (up to a maximum of $22) less $\frac{4}{5}$ of his wage during partial unemployment. Henry's regular wages were $38 weekly. For several weeks he was employed only part of the time and received wages of $10 a week. During this time he received weekly benefits of $\frac{1}{2} \times \$38$ less $\frac{4}{5} \times 10$. His total weekly income, therefore, was _?_.

3. For $8\frac{1}{2}$ weeks of unemployment, Jane Hudson received the maximum allowance in her state of $22 a week. How much did she receive in all?

Old-Age and Survivors Insurance includes millions of persons.[1]

The second program in the Social Insurance group — the Old-Age and Survivor's Insurance — probably created the greatest interest because it included more persons than any other program. We have already learned that many persons find great difficulty in making profitable investments over a period of years. All too often, persons find that they are too old or are physically unable to continue as breadwinners, yet they have neither salable property nor insurance to fall back upon. In fact, past records indicate that about 87% of the persons who reached the age of 65 were dependent on relatives, friends, or the general public. The purpose of the Old-Age and Survivors Insurance is to reduce this percentage by providing some regular monthly income to former wage earners and their families. Even as early as 1940, when the first benefits of the Social Security Act became payable, there were nearly fifty million workers with social security accounts. Many more accounts have been added to the list since that time.

The money to finance the Federal Old-Age and Survivors Insurance program comes from payroll taxes. For each social security account a tax is levied on the employer and employee in equal amounts. The employer is required to deduct the employee's part from wages due, add his own part, and send the total to the *Director of Internal Revenue.* A self-employed person must also pay a tax, but he pays at $\frac{3}{4}$ the rate of the combined rate for employee and employer. The money from these taxes is deposited in the Old-Age and Survivors Insurance Trust Fund.

Monthly payments are made to workers in covered employment (much like coverage for unemployment insurance) who are 65 years old and stop work. After a worker reaches 75, payments may be made even though he continues to work. A claim for benefits must be filed before payment can be made. Prompt filing will prevent any loss of benefits. Under stipulated conditions, monthly payments may be made to wives, widows, and dependent children, or to aged parents chiefly dependent.

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[1] To the Teacher. Literature regarding the OASI program may be obtained from the nearest field office of the Social Security Administration.

Questions for Discussion

1. Do you think that it is desirable for society to require wage earners to use a part of their wages to provide an income when they reach retirement age?

2. Do you think the Social Security Act places the government in competition with insurance companies?

3. What reasons can you give for or against requiring employers to pay as much as employees toward the Old-Age and Survivors Insurance program?

4. Can a highly paid executive draw retirement payments? For example, is the president of a large corporation, such as U. S. Steel or General Motors, legally entitled to retirement payments?

5. There are persons who object to the Social Security Act. Here are some of the arguments. Which, if any, do you accept as valid?

First Citizen: It tempts the government to extravagant and wasteful spending.

Second Citizen: In a great national emergency Congress will use the fund for purposes other than those planned.

Third Citizen: Since Congress is almost certain to change the Act, its provisions are uncertain.

Fourth Citizen: In the end the employer will pass his share of the burden to the employee in the form of reduced wages, or to the consumer in the form of increased prices on goods.

Retirement benefits can be computed.

To obtain benefits from Old-Age and Survivors Insurance, a worker at age 65 must retire from any work in covered employment that pays him more than $75 a month. However, if he keeps on working in covered employment his benefits are suspended for any month in which he earns more than $75. He may continue to work in covered employment (or in self-employment) after age 65, in order to build up his required number of quarters to be fully insured. After he reaches age 75, there is no limit to the amount he may earn and still obtain social security benefits. The amount which he will receive each month after becoming eligible is called his ***primary insurance amount***[1] (hereinafter called *insurance amount*). It is computed from his average monthly wage as follows:

(*a*) Determine the total wages worker has received in covered employment after 1950 and up to the beginning of the 2nd calendar quarter before the quarter in which he becomes eligible for benefits. (*b*) Divide this amount by the total number of months (both working and nonworking) since 1950, or age 22, if later. Calendar quarters begin on January 1, April 1, July 1, and October 1. Hence, for a worker who becomes entitled in June, only the first three quarters of the previous year can be used to determine the average monthly wage. Here is the way the insurance amount is computed:

(1) Take 55% of the first $100 of average monthly wage.
(2) Take 15% of the balance of the average monthly wage (the part above $100). (NOTE. The largest average monthly wage that can be used for determining the primary benefit is $300. Any part above $300 must be disregarded.)
(3) Add the amounts in (1) and (2) for the insurance amount.

What is the insurance amount for a man retiring at age 65 if his average monthly wage in covered employment after 1950 has been $180?

(1) 55% of the first $100 per month is $\$100 \times .55 = \$55$.
(2) 15% of the balance is $(180 - 100) \times .15 = \$12$.
(3) So his insurance amount is $\$55 + \$12 = \$67$.

Problems to Solve

1. Find the monthly insurance amount for each of the following average monthly wages:

$200 $240 $150 $210 $174 $190 $216 $230

2. Mrs. Mason is now 65 and files a claim for her social security benefits. Her average monthly wage in covered employment has been $192. If she continues to earn $70 a month in part-time work, what will be her total monthly income?

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[1] We have assumed throughout these pages that earnings after 1950 are used. The present-day student will not need to refer to the older type calculations that apply to earnings prior to 1950. There is no Social Security tax on wages above $3600 per year.

Family and survivors receive payments.

Now let's look at the amounts payable to the family of the wage earner. The following table shows some of the more common payments. Note that the benefit to any family member depends on the wage earner's insurance amount.

PERSONS RECEIVING PAYMENT	PAYMENT RECEIVED
A wife, age 65 or over, who does not have an insurance amount of her own equal to the amount she would get from her husband's account	$\frac{1}{2}$ of wage earner's insurance amount
A widow, age 65 or over	$\frac{3}{4}$ of wage earner's insurance amount
A widow, under 65 but with dependent children in her care	$\frac{3}{4}$ of wage earner's insurance amount
Each unmarried dependent child under 18 (when wage earner has retired)	$\frac{1}{2}$ of wage earner's insurance amount
Each unmarried dependent child under 18 (when wage earner is dead)	$\frac{1}{2}$ wage earner's insurance amount (an additional $\frac{1}{4}$ of amount is divided equally among all children)
In case of death of wage earner, each dependent parent, age 65 or over, if there is no widow or child who may ever qualify for payments	$\frac{3}{4}$ of wage earner's insurance amount
Surviving spouse who was living with wage earner at time of death	Lump sum of 3 times wage earner's insurance amount

How would you use this table to compute a total family payment? If any payment, as computed, is not a multiple of ten cents, it is rounded to the next *higher* multiple of ten cents. Suppose a man received an insurance amount of \$62.50 and had a wife 65 years old. If she does not have an insurance amount equal to one half that of her husband, she is entitled to $\frac{1}{2}$ of his insurance amount. Then, together they can get \$62.50 + \$31.30 = \$93.80 per month. And if they have a dependent child under 18, all three together can get \$120.10. (There is a limitation on total amount. See page 321.)

If the man dies, his widow and dependent child together can get $\frac{3}{4} \times \$62.50 + \frac{3}{4} \times \$62.50 = \$46.90 + \$46.90 = \$93.80$ a month. (Note that one child gets $\frac{1}{2} + \frac{1}{4}$, or $\frac{3}{4}$ of the insurance amount.)

But there are upper and lower limits to the amount that can be obtained. The law sets maximum and minimum payments for any wage earner and his family. No payment may be less than $25. That is, if a worker is entitled to any payment, he is sure to get as much as $25 a month. For a wage earner and his family together (or the surviving family) the largest monthly payment possible is the *smaller* of these two amounts: (*a*) $168.75 a month (except where additional amount results from rounding to next higher ten cents), or (*b*) 80% of his average monthly earnings. If the total exceeds the allowable amount, *each* dependent's payment is reduced to bring the total down to the minimum allowed. However, if family payments, as ordinarily computed, total $45 or more, they will not be reduced below $45.

Problems to Solve and Things to Do

1. Here are given several average monthly wages for retired workers. The benefits for an average monthly wage of $50 are computed. The total family benefit in this case is not .80 × $50, or $40, but is $45 because of the limitation that a computed total benefit of $45 or more may not be reduced below $45. Indicate in each blank space the appropriate benefits receivable.

AVERAGE MONTHLY WAGE	INSURANCE AMOUNT	BENEFIT FOR WIFE OVER 65	BENEFIT FOR ONE DEPENDENT CHILD	TOTAL FAMILY BENEFIT
$50	$27.50	$8.75	$8.75	$45.00
70				
80				
120				
200				
240				

2. Here are given four insurance amounts for deceased workers. Use these to compute the benefits which the indicated survivors would get. (NOTE. Each column must be computed independently.)

INSURANCE AMOUNT	WIDOW, AGE 40, WITH ONE DEPENDENT CHILD	WIDOW OVER 65	ONE DEPENDENT PARENT	ONE DEPENDENT CHILD
$40				$30.00
35.20				
26.40				
20				

(NOTE. In last column, first line, the benefit is $30.00. One child gets $\frac{1}{2}$ of $40, or $20, plus $\frac{1}{4}$ of $40, or $30. Two children would get $\frac{1}{2} + \frac{1}{2} + \frac{1}{4}$, or $50.)

3. Mr. and Mrs. Allison are both 65. Mrs. Allison is entitled to $23.40 monthly based on her husband's primary benefits. She also is entitled to benefits in her own right. She has earned an average monthly salary of $110 since January 1951. How much benefit can she get? (NOTE. She can collect the larger benefit.)

4.* Dale Calkins earned $180 a month since 1950. He left a widow, age 50, and 4 dependent children. What is the monthly family benefit? Without limitations the benefits would have been _?_. (Watch out for distribution between 4 children.)

5.* Tom Hays, who has earned an average of $60 a month since 1950, dies and leaves a widow with 4 dependent children. The benefits for this family would be only _?_ per month.

Special investigation

6. Get an estimate of the average monthly wage of five occupations in your community covered by the Social Security Act. Select some with low monthly wages and some with high. Now compute the monthly benefits which each family would receive if the father was engaged in each of these occupations since 1950 and if he was eligible to receive retirement benefits.

No Pencils Please!

Here and on page 324 are two pages for which you are to use pencils only to write down answers. You are not to do any figuring in the margins of your note paper.

1. Refer to page 302 and then find the five-year fire insurance premium if the one-year premium is:

(*a*) \$20 (*b*) \$30 (*c*) \$90 (*d*) \$100 (*e*) \$125 (*f*) \$25
(*g*) \$7.50 (*h*) \$10.25 (*i*) \$2.50 (*j*) \$6.25

2. Find the three-year fire insurance premium if the one-year premium is:

(*a*) \$10 (*b*) \$20 (*c*) \$40 (*d*) \$30 (*e*) \$100 (*f*) \$60
(*g*) \$12 (*h*) \$32 (*i*) \$2.50 (*j*) \$5.00

3. At 20 cents per \$100 of property value, what would the one-year fire insurance premiums be on these properties?

(*a*) \$100 (*b*) \$200 (*c*) \$500 (*d*) \$800 (*e*) \$2000 (*f*) \$5000
(*g*) \$7000 (*h*) \$10,000 (*i*) \$10,500 (*j*) \$20,500

4. Sam Andrews sells automobile and hospital insurance. He gets a commission of 10% of one year's premiums of all insurance he sells. What is his commission on each of these annual premiums?

(*a*) \$32.40 (*b*) \$54.19 (*c*) \$38.20 (*d*) \$42.16
(*e*) 16.50 (*f*) 72.94 (*g*) 23.15 (*h*) 47.29

5. The social security tax is $1\frac{1}{2}\%$ of an employee's wages on first \$3600 of yearly wage.[1] How much social security tax must be withheld on each of these weekly earnings? (HINT. First get 1%. Take $\frac{1}{2}$ of this and add the two amounts.)

(*a*) \$40.00 (*b*) \$100.00 (*c*) \$80.00 (*d*) \$64.00
(*e*) 50.00 (*f*) 120.00 (*g*) 90.00 (*h*) 36.00

6. The social security tax is also $1\frac{1}{2}\%$ of the employer's payroll (same limitation as in Ex. 5). How much tax must an employer pay on each of these weekly payrolls?

(*a*) \$50,000.00 (*b*) \$120,000.00 (*c*) \$1,400.00 (*d*) \$64,000.00
(*e*) 20,000.00 (*f*) 600.00 (*g*) 42,000.00 (*h*) 1,600.00

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[1] Rate scheduled to change in 1954 to 2% of first \$3600 of yearly wage.

No Pencils Please!

1. 42 hundredths ÷ 7 hundredths = $\underline{\ ?\ }$.

2. 25% of 116 = $\underline{\ ?\ }$. **3.** $.5\overline{)9.5} = 9 \div .5 + .5 \div .5 = \underline{\ ?\ }$.

4. $\frac{1}{5}$ of 540 = $\underline{\ ?\ }$. **5.** 12% of 250 = $12 \times 2.5 = \underline{\ ?\ }$.

6. 90% of 120 = $\underline{\ ?\ }$. **7.** @ 3 for 5¢, 2 doz cards will cost $\underline{\ ?\ }$.

8. Two tenths is contained in 1 $\underline{\ ?\ }$ times; in 10 $\underline{\ ?\ }$ times.

9. 1% of \$16 = $\underline{\ ?\ }$; $\frac{1}{4}$% of \$16 = $\underline{\ ?\ }$; $1\frac{1}{4}$% of \$16 = $\underline{\ ?\ }$.

10. $\frac{3}{4}$ of $\frac{4}{5} = \underline{\ ?\ }$; so $\frac{4}{5}$ of $\frac{3}{4} = \underline{\ ?\ }$.

11. The quotient of $31\overline{)1192}$ is very close to $\underline{\ ?\ }$.

12. Write the missing dividend $\begin{array}{r} 2\frac{1}{3}\text{ yd.} \\ 9\overline{)\ \ ?\ \ } \end{array}$

13. $\frac{9}{12} + \underline{\ ?\ } = 1$. **14.** 4 out of 50 = $\underline{\ ?\ }$%.

15. 19 out of 20 = $\underline{\ ?\ }$%. **16.** 35 out of 50 = $\underline{\ ?\ }$%.

17. $\frac{3}{4} = \frac{?}{8}$; so $\frac{3}{4}$ is what part of $\frac{7}{8}$?

18. Is the quotient of $82\overline{)79803}$ more or less than 1000? It is a $\underline{\ ?\ }$ -digit number.

19. The quotient of any number divided by 12 is $\underline{\ ?\ }$ of the number.

20. Which does not belong with the others?

$3.4\overline{)29}$ $\quad$ $34\overline{)290}$ $\quad$ $29 \div 3\frac{4}{10}$ $\quad$ $34\overline{)29.0}$ $\quad$ $\frac{2.9}{3.4}$

21. An increase in cost from \$20 to \$21 is an increase of $\underline{\ ?\ }$%. Is an increase from \$21 to \$22 an increase of more or less than 5%?

22. $3\frac{1}{4}$% of 400 = $\underline{\ ?\ }$. **23.** $4\frac{1}{2}$ is $4\frac{1}{2}$% of $\underline{\ ?\ }$.

24. Which quotient will be largest?

$\frac{9}{10} \div \frac{3}{4}$ $\quad$ $\frac{9}{10} \div \frac{1}{2}$ $\quad$ $\frac{9}{10} \div \frac{2}{3}$ $\quad$ $\frac{9}{10} \div \frac{5}{6}$

25. In which will the product be larger than the multiplicand?

(*a*) 7.9 × .8 (*b*) 79 × 8 (*c*) .79 × .08 (*d*) 7.9 × 80

Do you think that this young housewife should buy life insurance? If so, what kind do you believe is most desirable?

Philip Gendreau

PROBLEM V

What Security Does a Person Buy When He Pays Life Insurance Premiums?

The students in Mr. Reed's mathematics class voted to ask Mr. Perkins, a local insurance agent, to talk to the class on life insurance. In the discussion which followed, they listed questions that they would like to have the agent answer. Polly Fisher, who was delegated to invite Mr. Perkins, gave him the following list of questions when she invited him:

1. Why should a person buy life insurance?
2. What does a person have to do to buy life insurance?
3. What kinds of life insurance may one buy?
4. How much life insurance should a person buy?
5. How much does life insurance cost and how is the cost determined?
6. How may a person use his life insurance?

An insurance agent answers questions.

Mr. Perkins accepted the invitation, and here is the way he answered the questions:

"I believe that there are three good reasons why a person should buy life insurance. The first is that life insurance is a means of providing for dependents if death takes away the breadwinner. Payment on a life insurance policy is then a great help to the widow and children. The second reason for buying life insurance is that such buying encourages systematic saving. The third reason is that life insurance provides a safe way of investing your money. Even during depression years, life insurance companies continued to pay the just claims of their policyholders although many banks and other financial institutions failed to make full payments on their obligations.

"Your second question, 'What does a person have to do to buy life insurance?' is easily answered. First he should select one or more safe and reputable companies with long records of paying claims promptly. Then he should arrange to talk with at least one of the local agents. The agent will help the prospective buyer to decide on the kind and amount of insurance to buy, and will give him an application blank. Under certain circumstances, a physical examination by a doctor is required. Under others, the agent merely asks a few specific questions about the physical condition of the buyer and, if the answers indicate a healthy condition, no physical examination is necessary.

"This brings me to your third question, concerning the kinds of life insurance. There are really many different kinds of *life insurance policies* written. In general, though, there are three types. The first type, the ***term policy***, is the cheapest; that is, it requires the lowest payment, or *premium*, each year. For a period of years, known as the 'term' of the policy, the company guarantees to pay the full amount of the insurance, or *face value*, if death occurs during that time. The person whom the insured wishes to receive the insurance is called the *beneficiary*. If the insured is living at the end of the term, he receives nothing from the company. The second type, the ***ordinary life policy***, requires payments each year of the life of the insured. Whenever the policyholder dies, the beneficiary gets the face value of the policy. If the insured decides to stop paying the premium, the company pays him whatever amount may have accumulated to his credit at that time. This amount is called the *cash value,* or *surrender value,* of the policy. A variation of the second type is the ***limited payment life policy.*** It is very much like the ordinary life policy except that the premiums are payable for a specified period of years. At the end of that period the insurance remains in force without further payments. The third type, the ***endowment policy***, requires payments each year for a specified number of years. If the insured dies within this period, his beneficiary gets the face value of the policy. If he is still living at the end of the period, he receives the face value himself. This policy costs more than either of the other two types I have mentioned.

"These several kinds of policies are intended to serve the needs of different persons. You and Mr. Reed may wish to discuss the question, 'Who should buy each kind of insurance?' In discussing this you should remember that term insurance provides *protection only;* ordinary life and limited payment life insurance provide *part protection* and *part investment.* Endowment insurance also provides for both, but has more *investment value* than does ordinary life. Also, you should remember that the cost increases with each type in the order just mentioned.

"Your fourth question is, 'How much life insurance should a person buy?' Perhaps you expect me to say, 'The sky's the limit.' I have seen many persons, however, who bought so much insurance that they soon had to let some of it *lapse.* Therefore, I think it is better to say, 'A person's present and prospective income should be considered in deciding how much insurance to buy.' Then, too, he should let the amount be determined by the number of persons who are dependent upon him. Obviously this means much insurance for some and relatively little for others. Entirely different types of coverage for widely varying amounts are necessary for the youngster just starting to work, for the married person with small children, and for the middle-aged person with grown children. An agent for any reliable insurance company will gladly give you facts and figures on this question.

"Mr. Reed and I have decided that your other questions involve too much for me to answer on this visit. We think that you would like to work on them yourselves. I will leave some pamphlets which explain the costs and benefits of the various kinds of life insurance. If I can help you on them later, I'll be glad to visit you again."

Questions for Discussion and Things to Do

1. How many new words used by Mr. Perkins can you explain?

2. Do you agree with Mr. Perkins's three reasons for buying life insurance? Can you think of any other reasons?

3. Find out what rate of interest insurance companies are allowing on money invested with them. Do you know of any other place where money can be invested at a higher rate with equal safety?

4. What information do you think an insurance company gets from a physical examination of a prospective buyer of life insurance?

5. What are some physical conditions that may make it impossible for a person to get life insurance?

6. Do you think that some persons should buy each of the three kinds of insurance mentioned by Mr. Perkins?

7. Assume that your father wants to take out an insurance policy for you. What type of policy would you select?

8. Why is the annual premium on a life insurance policy less if a person starts the policy when he is young than it is if he starts the policy when he is older?

9. What did Mr. Perkins mean when he said that many persons have had to let their insurance lapse?

10. Obtain samples of the several kinds of life insurance policies. Examine each and answer the following questions:

(*a*) Does it have a saving and investment feature?
(*b*) Does it pay the full face value at death?
(*c*) How does the annual premium compare with other premiums?
(*d*) How long is the policy in effect?
(*e*) If the insured stops paying premiums, is he paid anything?
(*f*) Does it combine protection with saving?

11. If a person drops a term insurance policy, he collects no money but he has not *lost* any money. Explain.

12. Secure from a local agent the amount of the premiums on a $1000 ordinary life policy taken out at ages 15, 20, 25, 30, etc., to age 60. Prepare a graph showing the relationship of age to premium.

There are some important technical aspects of life insurance.

Insurance has a good many technical aspects, some of which are rather involved. However, at this stage you do not need to consider the difficult details. For each of the topics in this section it will be sufficient if you undertake a study or an activity which will give you a general understanding of that particular phase of insurance and which may suggest how to go about getting more detailed information.

A. The cash surrender value of a policy

A cash surrender value is a feature of most kinds of life insurance policies. It represents the investment part of the insurance. The company uses a part of each premium to build up the cash surrender value. If the policyholder pays a number of premiums and then decides not to pay any more, he can collect the cash surrender value. Or the policyholder can leave the cash value to buy *paid-up insurance,* the amount of which is determined by the age of the insured and the amount of the cash value. The company will pay the stipulated amount of paid-up insurance to the same person, and at the same time that it would have paid the original insurance.

It will be helpful at this point for the class to examine several policies to see whether each policy promises a cash surrender value.

B. Dividends

In general, an insurance company seeks to manage its affairs so as to accumulate more money than is needed to pay the cash surrender value and the face value. The profits of a company may be distributed as *dividends* either to the policyholders or the regular stockholders. Here we should note that there are two kinds of life insurance companies. In the ***mutual company*** the policyholders own the company. If the company declares a dividend, it is distributed to the policyholders. If a life insurance company is a ***stock company***, the stockholders own the company. If the stock company declares a dividend, it is distributed to the stockholders. However, stock company rates are usually lower than mutual company rates. From which kind of company would you expect to be able to buy participating insurance? From which kind would you expect to buy non-participating insurance?

In actual practice stock companies may sell both kinds of insurance. Such companies are really stock-mutuals. They keep separate accounts for the participating and the non-participating business. The participating policyholders share in the profits on their policies, and the stockholders share in any other profits of the company.

There are several ways a participating policyholder may use the dividends he gets each year. He may (1) receive them as cash, (2) use them to pay part of the premium due, (3) use them to purchase additional insurance, or (4) deposit them with the company to accumulate at a specified rate of interest. The choice which a policyholder makes is usually determined by the conditions facing him at the time he receives the dividends. Can you think of a reason why a policyholder might prefer the first option? the second? the third? the fourth?

C. Settlement of claims

When the beneficiary claims payment of an insurance policy, he may elect to settle in any one of several ways. (In case an endowment policy matures before the death of the policyholder, the insured is the beneficiary.) The most common ways are as follows: First, he may collect the face value of the policy in cash. Second, he may leave the money with the company and collect only the annual interest. Third, he may have the company pay him a certain stipulated amount each year for a specified number of years, or for life; the amount of such yearly payments depends upon the face value of the policy and the age of the beneficiary. Can you describe briefly a situation in which a person might prefer one of these methods of settlement?

D. Conversion

Insurance companies may permit a policyholder to change his insurance to another kind. For example, a person who has a term insurance policy may convert it into an ordinary life policy; or a person with an ordinary life policy may convert it into a 20-year endowment policy. In general, this conversion may be made in either of two ways. First, he may start the new policy on the premium date of the present policy. If the existing policy has a cash value, he may use this cash to pay premiums on the new policy. Second, the change may be made on the assumption that the new policy has been in force since the beginning of the old one. If the premiums on the new policy are larger, the insured must make a payment for back premiums. The payment will equal the difference in the reserves of the old policy and the new policy. Interest on back premiums is compounded annually. If the change is from a more expensive policy to a less expensive policy, the company makes an adjustment for the difference. The amount of this adjustment depends on the difference between the cash surrender value of the old policy and of the new one for the same period of time. (Ordinarily *short*-term insurance has no cash surrender value.)

Questions to Discuss and Things to Do

1. Below is a specimen table which shows the cash value for each of 10 years of a $1000 ordinary life policy bought at age 24. (There is no cash surrender value on this policy until the 3rd year that the policy is in force.) It also shows how much paid-up insurance the cash value would buy.

CASH SURRENDER VALUES OF $1000 ORDINARY LIFE POLICY

AT END OF YEAR	CASH VALUE	AMOUNT OF PAID-UP INSURANCE CASH VALUE WILL BUY	AT END OF YEAR	CASH VALUE	AMOUNT OF PAID-UP INSURANCE CASH VALUE WILL BUY
3	$20.47	$55.71	8	$68.81	$172.57
4	27.73	74.28	9	81.86	201.83
5	35.21	92.81	10	95.21	230.74
6	43.64	113.16	11	106.39	253.38
7	56.07	143.00	12	117.90	275.88

If the premiums (after deducting any dividends) paid on the policy referred to in the above table were $19.68, how much would be paid out by the policyholder in 12 years? How much more is this total of 12 premiums than is the cash surrender value after 12 years?

2. Draw two line graphs on the same axes. Let one show the total amount of premiums paid at the beginning of each of the years 3 to 12 for the policy mentioned in Ex. 1. Let the other graph show the cash surrender value at the end of each of the years given in the table above. Do you observe any trend in these two lines? Do you think this trend would continue if the graph was continued? Why?

3. The cash surrender value on a policy is $117.90 at the end of the 12th year. Disregarding interest, for how many whole years would this pay the premium of $27.18 on a new policy?

4. Mr. Black received these dividends: $4.11, $2.96, $3.67, $3.26, and $5.15 on his $1000 ordinary life policy at the end of each of the first 5 years. This is an average of _?_ a year in dividends. If this average is continued throughout the 25-year life of the policy, Mr. Black will receive a total of _?_ in dividends.

5. Mrs. Carter has received these dividends during the past 5 years of her $1000 20-year endowment policy: $4.96, $7.95, $6.80, $5.74, and $9.70. The average dividend for these 5 years was _?_. The annual premium for Mrs. Carter's policy was $42.30. On the average what per cent of the premium would the dividends pay?

6. Here are the premiums charged and dividends declared by five insurance companies in one year. Find the payment which would be required in each case if dividends were used to reduce premiums. If these can be considered average conditions, why might you prefer to buy insurance from Company A rather than from Company D?

COMPANY	PREMIUM	DIVIDENDS	PREMIUM LESS DIVIDENDS
A	$106.98	$17.44	_?_
B	108.12	17.34	_?_
C	105.50	10.00	_?_
D	100.26	9.14	_?_
E	102.16	10.72	_?_

7. Over a 20-year period dividends declared by an insurance company amounted to $67.60 on Mr. Oliver's policy. Mr. Oliver's premiums for this period amounted to $384.20. If he applied his dividends to reduce the premiums, his average annual payment was _?_.

8. Helen Wood's premium on her $1000 ordinary life policy is $16.31. She has received average annual dividends of $3.99 during the 20 years that the policy has been in force. Now the cash value is $160.03. If she collected the cash value, how much would her insurance have cost her, on the average, for each of the 20 years?

9. In the following problem how much may be accumulated by depositing dividends with the company?

Assume a $5000 ordinary life policy. The dividends in its first 3 years have been: $17.45, $11.40, and $16.20. The average of these three dividends is the amount that can be deposited with the company each year for 20 years. Three per cent interest compounded annually is allowed. (One dollar deposited every year for 20 years will produce $27.68.)

SOLUTION. The average of the three dividends is _?_. This amount times $27.68 equals _?_, which is the amount that is accumulated by depositing dividends with the company.

10. At the death of her husband, Mrs. Perry collected her husband's $5000 life insurance in cash. She used $2000 to pay funeral expenses and outstanding bills, and invested the balance in U. S. Savings Bonds, Series E. Provided she does not touch this investment, how much will it amount to 10 years hence, when her son is ready for college? (If necessary, refer to United States Savings Bond table, Unit V.)

11. Mr. Jones has had a term insurance policy for 6 years and wishes to convert to a 20-year endowment. He elects to start the new policy at the same date as the old. The premium on the term policy is $58.90, and on the 20-year endowment it would have been $251.10. Therefore, Mr. Jones must accompany the conversion with a payment of _?_. (Neglect any interest payments.)

12.* During the time that William Frost was on active duty with the armed forces he was covered by $10,000 worth of insurance provided by law. At the time of his discharge from active duty he decided to continue being covered by the same amount of insurance. His premium rate for $10,000 worth of term insurance was $7.90 per year per $1000. After 6 years, he converted his term insurance to 30-payment life insurance. He could pay the difference in back premiums at the rate of $10.58 per year per thousand dollars and then continue to pay $18.82 per year per thousand for 24 years, or he could begin at the new rate of $20.84 per year per thousand and pay for 30 years. (There is no cash value for the term policy.) Which would be the cheaper and how much? (Neglect interest and reserves.)

MORTALITY RATES AND LIFE EXPECTATIONS

American Experience Table of (Insured) Mortality

Age	Number Living	Deaths Each Year	Death Rate per 1000	Expect. of Life	Age	Number Living	Deaths Each Year	Death Rate per 1000	Expect. of Life
10	100,000	749	7.49	48.72	**53**	66,797	1,091	16.33	18.79
11	99,251	746	7.52	48.08	**54**	65,706	1,143	17.40	18.09
12	98,505	743	7.54	47.45	**55**	64,563	1,199	18.57	17.40
13	97,762	740	7.57	46.80	**56**	63,364	1,260	19.88	16.72
14	97,022	737	7.60	46.16	**57**	62,104	1,325	21.33	16.05
15	96,285	735	7.63	45.50	**58**	60,779	1,394	22.94	15.39
16	95,550	732	7.66	44.85	**59**	59,385	1,468	24.72	14.74
17	94,818	729	7.69	44.19	**60**	57,917	1,546	26.69	14.10
18	94,089	727	7.73	43.53	**61**	56,371	1,628	28.88	13.47
19	93,362	725	7.76	42.87	**62**	54,743	1,713	31.29	12.86
20	92,637	723	7.80	42.20	**63**	53,030	1,800	33.94	12.26
21	91,914	722	7.85	41.53	**64**	51,230	1,889	36.87	11.67
22	91,192	721	7.91	40.85	**65**	49,341	1,980	40.13	11.10
23	90,471	720	7.96	40.17	**66**	47,361	2,070	43.71	10.54
24	89,751	719	8.01	39.49	**67**	45,291	2,158	47.65	10.00
25	89,032	718	8.06	38.81	**68**	43,133	2,243	52.00	9.47
26	88,314	718	8.13	38.12	**69**	40,890	2,321	56.76	8.97
27	87,596	718	8.20	37.43	**70**	38,569	2,391	61.99	8.48
28	86,878	718	8.26	36.73	**71**	36,178	2,448	67.66	8.00
29	86,160	719	8.34	36.03	**72**	33,730	2,487	73.73	7.55
30	85,441	720	8.43	35.33	**73**	31,243	2,505	80.18	7.11
31	84,721	721	8.51	34.63	**74**	28,738	2,501	87.03	6.68
32	84,000	723	8.61	33.93	**75**	26,237	2,476	94.37	6.27
33	83,277	726	8.72	33.21	**76**	23,761	2,431	102.31	5.88
34	82,551	729	8.83	32.50	**77**	21,330	2,369	111.06	5.49
35	81,822	732	8.95	31.78	**78**	18,961	2,291	120.83	5.11
36	81,090	737	9.09	31.07	**79**	16,670	2,196	131.73	4.74
37	80,353	742	9.23	30.35	**80**	14,474	2,091	144.47	4.39
38	79,611	749	9.41	29.62	**81**	12,383	1,964	158.60	4.05
39	78,862	756	9.59	28.90	**82**	10,419	1,816	174.30	3.71
40	78,106	765	9.79	28.18	**83**	8,603	1,648	191.56	3.39
41	77,341	774	10.01	27.45	**84**	6,955	1,470	211.36	3.08
42	76,567	785	10.25	26.72	**85**	5,485	1,292	235.55	2.77
43	75,782	797	10.52	26.00	**86**	4,193	1,114	265.68	2.47
44	74,985	812	10.83	25.27	**87**	3,079	933	303.02	2.18
45	74,173	828	11.16	24.54	**88**	2,146	744	346.69	1.91
46	73,345	848	11.56	23.81	**89**	1,402	555	395.86	1.66
47	72,497	870	12.00	23.08	**90**	847	385	454.54	1.42
48	71,627	896	12.51	22.36	**91**	462	246	532.47	1.19
49	70,731	927	13.11	21.63	**92**	216	137	634.26	.98
50	69,804	962	13.78	20.91	**93**	79	58	734.18	.80
51	68,842	1,001	14.54	20.20	**94**	21	18	857.14	.64
52	67,841	1,044	15.39	19.49	**95**	3	3	1000.00	.50

The American Experience Table is used by many life insurance companies in calculating the amount of premiums to be charged on policies.

The American Experience Table of Mortality is used in determining life insurance premiums.

The table on the opposite page is widely used by American insurance companies. Obviously, a company must know how many death claims it is likely to have, for the company must collect enough in premiums to meet these claims.

Now let's see how the table is read. The items in the first two columns show that of a group of 100,000 10-year-olds we may expect 99,251 to be alive at age 11. What does the third column show? the fourth? the fifth? How many of the original 100,000 may be expected to be alive at ages 40? 50? 60? 70? 80? 90? 95?

Why do you think this table is called an "experience" table? In using the table, insurance companies make the assumption that, on the average, as many claims for any group will be made in the future as have been made in the past. Experience in using the table for about 75 years has shown that this assumption is a safe one. Of course, the table will not predict when you will die. In brief, it cannot be used for individual prediction. Remember that all insurance is based on averages. Again we are reminded that the idea of coöperation is basic in all insurance, for in life insurance those who live long help the dependents or beneficiaries of those who die young.

Questions to Discuss and Problems to Solve

1. At what age is the greatest number of deaths expected? At what age is the smallest number expected?

2. Beginning at age 10 the number of deaths expected each year decreases for several years. At what age does this decrease stop?

3. The table shows in the fourth column the expected death rate per 1000. How would you say this rate changes with age? How does this change show that insurance premiums should increase with age?

4. How many of the original 100,000 are expected to die after reaching age 30 but before reaching age 40? after reaching age 40 but before reaching age 50? Should the difference in insurance premiums at ages 30 and 40 be the same as the difference in premiums at ages 40 and 50?

5. A person at age 67 has an average life expectancy of 10 years. This means that an insurance company which sells him a $1000 ordinary life policy should put aside from the premiums an average of ? each year to pay this claim when due.

6. Does the table on page 334 mean that people who buy life insurance don't live to be older than 95? If not, what is the meaning of the table at this age?

Group insurance is a special type of life insurance.

Persons who work for the same employer frequently purchase insurance as a group. Insurance companies usually require that 75% of the eligible employees in any company must join the group and that the groups must consist of at least 50 members. The policy is written on the average age of the group and usually is 1-year renewable term insurance. The rates are low in comparison with other insurance

Ewing Galloway

Do you know why an employer is usually willing to pay a part of the group insurance premiums for employees such as those shown here?

policies for comparable ages. Several reasons account for the low rate. The agent's fee per policy is small, there is no fee for medical examination, and most workers are in low death-rate range. Moreover, since short-term insurance is the kind bought, no part of the premium is used to build up a cash surrender value.

Usually the employer pays part of the premium. He may pay larger parts of the premiums of older employees than of younger ones, thus rewarding length of service to the company.

Problems to Solve and Things to Do

1. The Allied Cereal Products Company insures the lives of three fourths of its 3200 workers through group insurance. The premium rate is $1.25 per month for each $1000 of insurance. The company pays 40% of the premium and the employees 60%. If $1200 is the average amount of insurance each employee carries, what is the total monthly cost to the company? What is the monthly cost to the average employee?

2. Thelma Rice is 20 and works for a company which permits its employees to buy group life insurance. The premiums are based on age 35, the average for the group. Thelma's part of the premium on a $1000 policy is 60 cents a month. At her age she might buy a $1000 policy of individual term insurance for $9.37 a year. How much cheaper is her group insurance each year than individual insurance would be?

Special investigation

3. Select a company in your community that has a group insurance plan for its employees. Try to get as much information about the plan as you can from a representative of the company. Perhaps the class will help you in selecting the questions to be used in the interview. Prepare a report for the class, based on your interview.

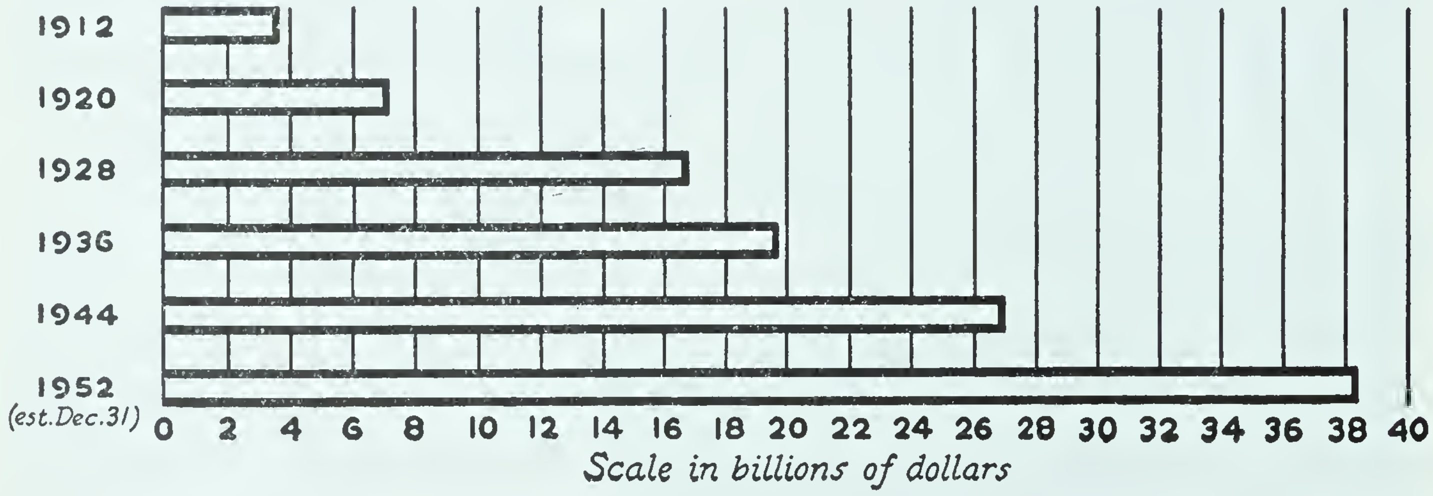
If there is no group insurance plan in your community, you can write to almost any of the large life insurance companies for information. For example, the Prudential Insurance Company of America at Newark, New Jersey, publishes a booklet, *Group Life Insurance,* which will provide you with the facts needed for this report.

Industrial insurance is a type of life insurance that is widely sold.

Would you like to spend a nickel a week to buy some life insurance of your own? You can. If you are 17 years old, your 5 cents a week will buy about $125 worth of insurance. This kind of insurance is called ***industrial insurance.*** In some insurance companies any member of a family up to age 65 or 70 may buy it; and medical examination is usually not required. Generally, the premiums are collected weekly by agents of the insurance company.

As the name suggests, industrial insurance is sold largely to wage earners who cannot afford to pay the larger annual premiums of regular insurance. It is also sold to persons who might not pass the medical examination required for regular life insurance. The industrial insurance business has grown rapidly in the United States since its beginning in 1875. This growth is pictured in the accompanying graph, which shows the amount of industrial insurance outstanding for the years represented. You will agree, will you not, that the total amount of this type of insurance is truly surprising? Why do you think the amount is so large?

INDUSTRIAL INSURANCE OUTSTANDING 1912–1952



Industrial insurance is more expensive than ordinary insurance for two reasons. First, the method of collecting premiums each week is costly; second, death rate among industrial insurance policyholders is considerably higher than among ordinary life insurance policyholders or even among the population as a whole. Can you explain why these two factors tend to cause high premiums?

Problems to Solve and Things to Do

1. Write to the office of your state insurance commissioner for information about industrial insurance in your state. You may wish to ask such questions as, "How much of this kind of insurance has been sold in the state in recent years?" and "What laws regulate the business?"

2. Perhaps you can interview an agent for a company that sells industrial insurance and thus get the answers to the questions in the preceding exercise. Ask him how much industrial insurance each member of your class can buy with a payment of 5 cents a week. To get an answer to this question, you will need to furnish the agent with a list of the ages of your classmates.

3. Louise Jones pays weekly premiums on her industrial insurance at the rate of 50 cents per $1000. This is an annual premium rate of _?_ per $1000. At her age Louise could buy a $1000 ordinary life policy with the same company for an annual premium of $21.27. This would be _?_ cheaper per year than her industrial insurance.

4. For 5 cents a week Lydia Green buys $125 of industrial insurance. At this rate the weekly premium on $1000 would be _?_. The annual premium on $1000 would be _?_.

5. Sadie Brown paid 15 cents a week for her $345 of insurance. She died after paying her premiums regularly for 10 years. The claim on the company was _?_ more than the sum of the premiums.

6. The Mutual Insurance Company charges 30 cents weekly for an industrial life policy for $300 at age 38. This rate is the same as _?_ annually on $1000. The rate with the same company for a 20-year limited payment life policy is $32.15 annually for a $1000 policy. The annual rate for the limited payment life insurance is _?_ less than the annual rate for industrial insurance.

7. The insurance company which has insured Robert Young allows 10% discount on premiums if they are paid directly to the company instead of to an agent. If Robert took advantage of this discount, how much could he save on his 15-cent weekly premiums in 10 years?

Harold M. Lambert from Frederic Lewis

The man shown here has retired from active business so that he may enjoy puttering about his home and garden. Can you see how an annuity would help?

Insurance companies sell annuity contracts.

There is a fundamental difference between life insurance and annuities. The chief purpose of life insurance is to provide for the emergency of death at an early age. An annuity, on the other hand, is intended to provide for loss of income, which usually accompanies old age. The purpose of the annuity is achieved by guaranteeing to the *annuitant* (owner of the contract) a fixed and definite income for life after a certain age. The income from an annuity may be collected in annual, semiannual, quarterly, or monthly installments.

The life annuity is well suited to those who are without dependents or to those who have reached the time of life when they wish to be relieved of all financial worries. It has been claimed that persons with annuities tend to live longer than persons without such policies. Do you see a reason why this might be true?

As in the case of life insurance, there are several kinds of annuities. They differ primarily in the method of making the payments to the annuitant. The three most common kinds are the *straight life, installment refund,* and *cash refund* annuities. In the case of ***straight life annuity***, the annuitant receives payments regularly as long as he lives. If at his death there is any money which he would have been paid had he lived his full expectancy of life, that money becomes the property of the insurance company. This money is used to make regular payments to annuitants who live beyond their full expectancy of life. Many persons dislike this forfeit feature of life annuities.

Consequently they buy either an installment refund annuity or a cash refund annuity. The ***installment refund annuity*** provides that any part of the original principal remaining at the death of the annuitant must be paid to a beneficiary. With a ***cash refund annuity***, the beneficiary receives all of the unpaid balance of the annuity in a lump sum at the death of the annuitant.

An old person commonly buys an annuity with a single premium payment and arranges to have the benefit payments start *immediately.* A young person usually prefers to make payments on his annuity over a period of years and have the income payments *deferred* (held by the company) until some age when he expects to retire. But a young person who has a large sum of money to invest may prefer to make a single payment with the income payments deferred.

Problems to Solve

1. Mr. Duncan bought a retirement annuity at age 30. His payments were $21.23 a year. At age 65 the value of the contract was $1295.52. How much more was the value of the contract than the total value of the payments made?

2. When Mrs. Dory started receiving payment on her retirement annuity at age 65, the value of the contract was $4385.16. She received $30 a month until she died at the age of 76. How much of her policy remained unpaid? (Disregard interest.)

3. Mrs. Thomas used her husband's $1000 life insurance at his death to buy a single-payment immediate life annuity. Annually she received $74.49 until she died 20 years later. She therefore collected _?_ more than she paid for the annuity.

4. Mr. and Mrs. Harmon each bought a $2000 single-payment immediate life annuity at age 65. Mr. Harmon receives $171.30 annually from his annuity, but Mrs. Harmon gets only $146.50 each year from hers. How many whole years will it take Mrs. Harmon to collect as much as Mr. Harmon does in 10 years? (This difference in returns for husband and wife is explained by the fact that women with annuities live on the average about 4 years longer than do men with annuities.)

There is an appropriate life insurance plan for each individual.

Every person has his own insurance needs. A young unmarried man who has a good income and no dependents should probably buy endowment insurance. For a young married man with low income, term insurance may be better because he can carry more protection at a smaller cost. In the problems that follow you will see how different situations call for different insurance plans.

Questions to Discuss and Problems to Solve

1. When Mr. Neff was married, he had a 15-year endowment policy of $2000 and his wife a 15-year endowment policy of $1000. He continued his wife's policy and converted his to a $5000 ordinary life. Why do you think he made the change?

2. When the Neffs' first child was born, Mr. Neff added $5000 of term insurance. He carried the term insurance for 10 years and dropped it. Do you think adding the extra insurance and then dropping it was a wise move?

3. Mr. Jacobs is now 50 years old and has two grown children who are self-supporting. His income is about $5000 a year. He has $10,000 ordinary life insurance. Should he convert to an annuity?

4. Some insurance counselors give this advice: A man with a family and a mortgaged home should carry enough life insurance to cover the mortgage. Do you think this is a good plan?

5. When Mr. Harrison was accidentally killed, he left $20,000 in life insurance. Mrs. Harrison has a girl 10 years old and a boy 12. Should she buy insurance with this money? If so, how much and what kind?

6. Mr. and Mrs. Neal have two sons, 20 and 18, who are in college. Mr. Neal's income is $10,000 a year. He decided to change his insurance holdings as follows: Buy two $5000 term insurance policies, making the boys beneficiaries. Convert all his other insurance into a retirement annuity.

Was this wise? Give three reasons for your answer.

Final Test on Unit VI

PART I: NEW TERMS

Copy the following and write one of the eleven words in the proper blank in the following statements:

1. Mr. Bell has a life insurance __________ with a __________ of $3000. His annual __________ reduces his __________ about $12 a year. Mr. Bell says that his insurance is cheaper with a __________ company than it would be with a __________ company. At present the __________ of this policy is $105.63. He is not interested in annuities because he is eligible for a rather large __________ from his __________ account.

Mr. Bell also carries __________ and __________ insurance on his automobile.

1. social security
2. dividend
3. cash value
4. premium
5. face value
6. stock
7. mutual
8. property damage
9. public liability
10. insurance amount
11. policy

PART II: PROBLEMS

2. How much will it cost to buy $4500 of fire insurance for 3 years on a house for which the 1-year rate is 24 cents per $100?

3. Mr. Liptak was transferred from California to New York by his company. He shipped his furniture valued at $1800. He insured it against damage or loss for two weeks at a rate of 2 cents per day for each $100 up to $1000 value; for all above $1000 he paid only 75% of this rate. What premium did he pay?

4. The Atlas Company had stored in its warehouse $150,000 worth of merchandise. It planned to move the entire stock within 90 days; so it insured the goods against fire and water damage for 80% of the goods' value. If the rate was 14 cents per $100 per year and the 90-day rate was 40% of the annual rate, what was the 90-day premium?

5. Marie Ullezck drives back and forth to work each day. She has paid premiums for 11 years on fire, theft, and collision sustained insurance. During the ninth year she had an accident and collected $352.80. If her average annual premium was $27, how much did she save by carrying insurance?

6. George Walsh's policy guarantees $125 a month for the first 3 years of total disability and $75 a month for the next 6 years. What are the maximum benefits he can collect? After carrying this insurance at the rate of $68 per year for 23 years, he was totally disabled in an accident. If he remained disabled for 6 years, did he receive more or less than he paid out?

7. In Fred Palotti's state a person may receive benefit allowance for partial unemployment. The amount allowed is determined as follows: Deduct $2 from the pay for partial unemployment and subtract the remainder from the amount of full unemployment benefit, which is $\frac{1}{2}$ the full-time wage, or $22, whichever is less. Fred's regular weekly wage is $42 a week, but for 9 weeks he was employed only part time at $20 a week. What was his total benefit payment for the 9 weeks? What was his total weekly income during the time of his partial unemployment?

8. The cash value of a $5000 life insurance policy is $476.05 at the end of 10 years. This is how much less than the total of the annual premiums of $98.40, if dividends are disregarded?

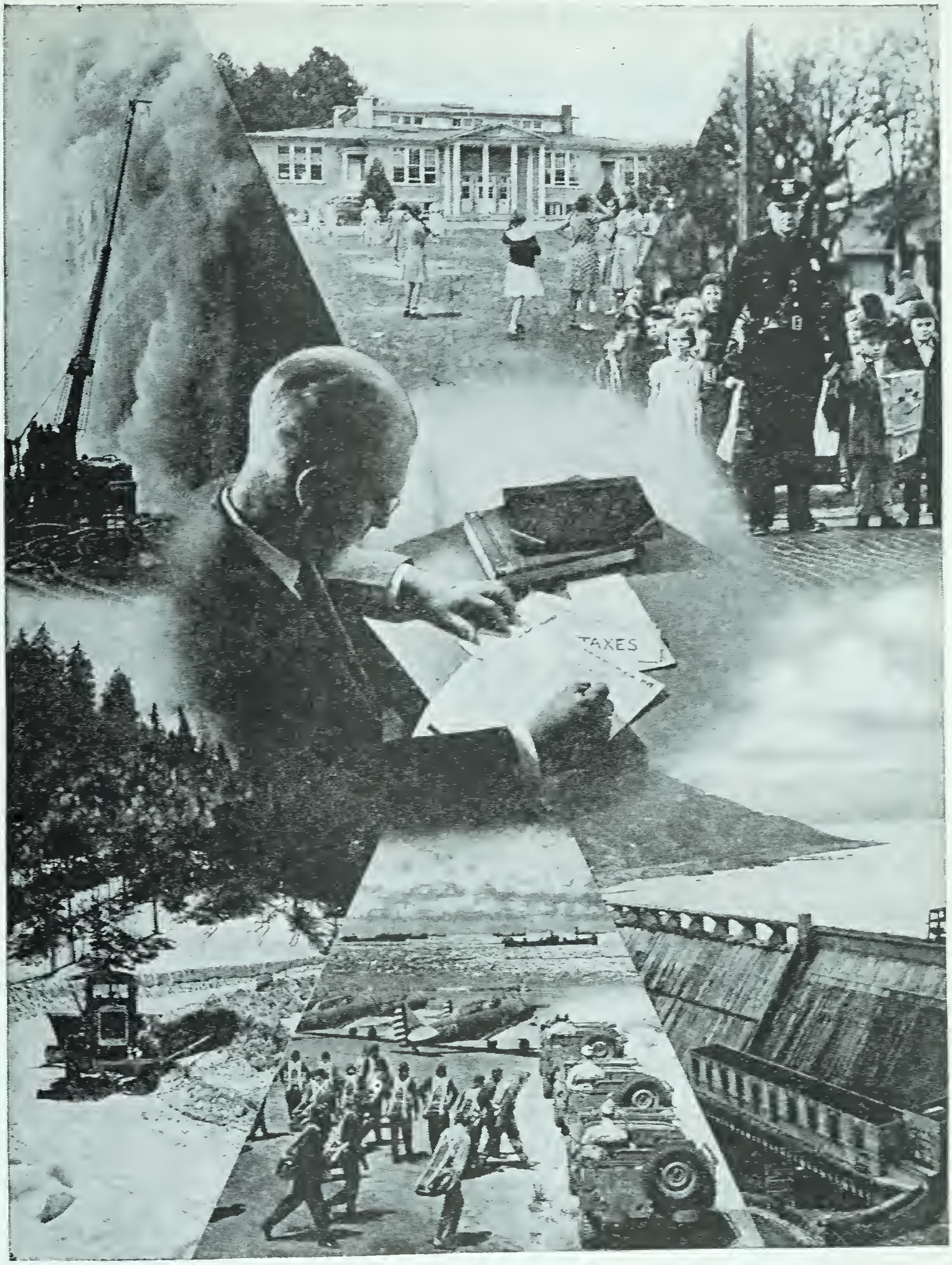
9. Find the social security insurance amount for a retired wage earner who is fully insured in covered employment and who has received an average monthly wage of $240.

10. Arthur Mundson paid 20 cents a week for $300 of industrial insurance. After paying regularly for 16 years and 14 weeks, he died. How much more did his beneficiaries receive than Arthur had paid?

PART III: INSURANCE SITUATIONS

11. Mr. and Mrs. Bell have been married for 16 years. They have three children. Dorothy is 14, Nancy is 12, and Romey is 8. Mr. Bell is 40 and Mrs. Bell is 36. Mr. Bell's income from his law practice is about $450 a month. They are paying for their home and own a car. Describe the several kinds of insurance Mr. Bell might well carry at this stage, and explain why you think he should carry them. (Suggest an amount for each kind of insurance.)

12. Mention some conditions under which you think it would be wise to buy term insurance; endowment insurance.



UNIT VII

Taxation

Buying Services and Conveniences at Low Cost

When Frank Wilson was a small boy, he lived on a farm four miles from the nearest town. The county highway, which ran past the farm and into town, was a dirt road. In those days the highway was not kept up by the county, and sometimes it became almost impassable. So, to keep the road in usable condition, the farmers in the neighborhood, including Frank's father, coöperated in doing the necessary work. Together, they bought a second-hand road scraper and each one took his turn in supplying farm horses to pull it. Whenever the road was badly in need of repair, several of the farmers would take time off from their farm work and put the road back into condition for travel. Frank is now grown up and has a new home of his own. But he travels over hard-surfaced roads in his automobile, and he never has to stop his work to help repair the roads.

Who keeps these roads in repair? Does Frank Wilson actually help in building and repairing the roads he uses even though he does not give his time or his tractor? Would you agree that by paying taxes on gasoline and by buying an automobile license Frank is coöperating with his neighbors in keeping in repair the roads they use? How does this coöperation differ from that which existed in his father's day?

Most persons complain when they have to pay taxes. However, there is probably no better plan for building roads than the present one of taxation. What are some of the other public services that are purchased with tax money?

Let's assume that Frank Wilson's salary is $4500 a year, or nearly $90 per week. And let's further assume that he pays $90 per year (one week's salary) in gasoline taxes and license fees for the upkeep of roads. What are some of the reasons why it is better for Frank to pay this $90 than for him to work six or seven days a year repairing roads?

It costs from $30,000 to $60,000 per mile to build a first-class double-lane highway, and a great deal of money is required to maintain it in good condition. If Frank Wilson travels over 10,000 miles of road in a year, he is getting the use of roads that probably cost more than $500,000,000. For this service he pays about $90 a year in taxes. Wouldn't you agree that he gets a lot for his money when he buys good roads by the coöperative methods of taxation?

PROBLEM I

What Are the Kinds and Sources of Taxes?

When a person complains about his tax bills, he may not realize the range and the value of the services he buys with his tax money. He may fail to recognize that by paying taxes he is taking part in a tremendous coöperative enterprise by means of which services are provided for everyone — services that individually no one could afford. Of course, a person is justified in complaining about paying high taxes if he sees large amounts of tax money being wasted; and it must be admitted such waste happens far too often. It is, therefore, the responsibility of every citizen to protect himself and his fellow citizens by being ever alert to the use of tax money.

How many different kinds of taxes can you list? Do some of these produce much more revenue than others? From what kinds of taxes does the Federal government get most of its revenue? Are we finding new taxes, and are some of our older taxes decreasing? These are some of the questions this unit will help you answer.

There are direct and indirect taxes.

If you were told that your taxes in 1951 amounted to about $417, you would probably be greatly surprised. You might even contend that in 1951 you were not old enough to pay taxes. But actually you do pay taxes every day, and your parents pay a great deal more.

If you paid less than $417 in taxes in 1951, somebody else had to pay more than that amount. And here is the reason. In 1951 Federal taxes amounted to about 46 billion dollars, and state and local taxes added around 17 billion dollars more to the American tax bill. Divided equally among the 151,000,000 men, women, and children in this country, the individual average tax bill for that year was approximately $417.

Income taxes on individuals and corporations accounted for the largest part of this tax bill. But you helped to pay the tax bill of the country every time you went to a movie or a football game. And if you bought any gasoline for the family automobile, you paid taxes with the pennies that were added to the cost of each gallon of gasoline.

These are a few of the obvious taxes (direct taxes) you paid, but you paid many more less obvious ones (indirect taxes). For example, you helped pay the corporation income taxes whenever you bought anything, because obviously the income of corporations comes from sales of goods and services to persons like yourself. And taxes which the corporations pay must be added to the cost of such goods and services.

Questions to Discuss and Things to Do

1. Make a list[1] of the services that are available to your family and to your neighbors and which are paid for by money from taxes. Which are Federal services? state services? local services?

2. When are taxes too high in the interest of individuals? in the interest of business concerns?

3. Under what conditions may taxes be too low in the interest of individuals or business concerns who pay them?

4. The estimated amount of national income in the United States in 1952 was $287 billion. Estimated taxes paid to all levels of government amounted to $66 billion. In 1940 the estimated income in the United States was $97 billion and total taxes amounted to around $15 billion. In which year do you think it was easier for John Q. Citizen to pay his tax bill? Why? Remember living costs increased over 87% in these thirteen years.

5. What are some conditions that make it wise for a local or state government or the national government to borrow money to be paid back from future tax money?

6. Do you think it is wise to tax one state or locality to help another to provide public services such as roads and schools? Why?

7. Explain how taxes may be used to regulate competition for trade at home and with foreign countries.

8. Find out what the conditions are in your county or city under which a person's property can be sold to collect taxes. How do you think this law can be justified?

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[1] TO THE TEACHER. A consolidation of the students' lists might be displayed in the classroom and added to from time to time.

Taxes may be at fixed rate or progressive rate.

You have seen that there are many kinds of taxes. Most of them are *fixed rate* taxes. In this group belong the sales taxes. The more goods and services you buy, the more tax you pay, but the rate is unchanged. Property and social security taxes are also fixed rate taxes.

Other taxes are paid at a *progressive rate,* or *graduated rate.* Income, death, and gift taxes belong in this group. The larger the income, estate, or gift, the larger fraction of it must be paid in taxes. For example, in recent years the Federal income tax rate has been about 20% on net incomes of $2000, but the tax rate has been about 79% on net incomes of $200,000. (Net income is income after allowing exemptions.) The purpose of a progressive rate tax is to enable the government to collect more money by taking a larger fraction of each dollar from the persons who have larger incomes.

Questions to Discuss and Problems to Solve

1. What is the difference between a fixed rate tax and a progressive rate tax? State some advantages and the disadvantages of each.

2. What is the tax rate on a net income of $4000 if the amount of tax is $856? What is the tax rate on a net income of $10,000 if the amount of tax is $2696? on a net income of $20,000 if the tax is $7396?

3. The school tax rate in Jonesville is $1.50 per $100 of property value. How much is the school tax on property valued at $5000?

4. Miss Harper's automobile license costs 40 cents per 100 pounds of weight. If her car weighs 3260 pounds, how much does her license cost when computed to the nearest 100 pounds? Is this an example of a fixed rate or a progressive rate tax?

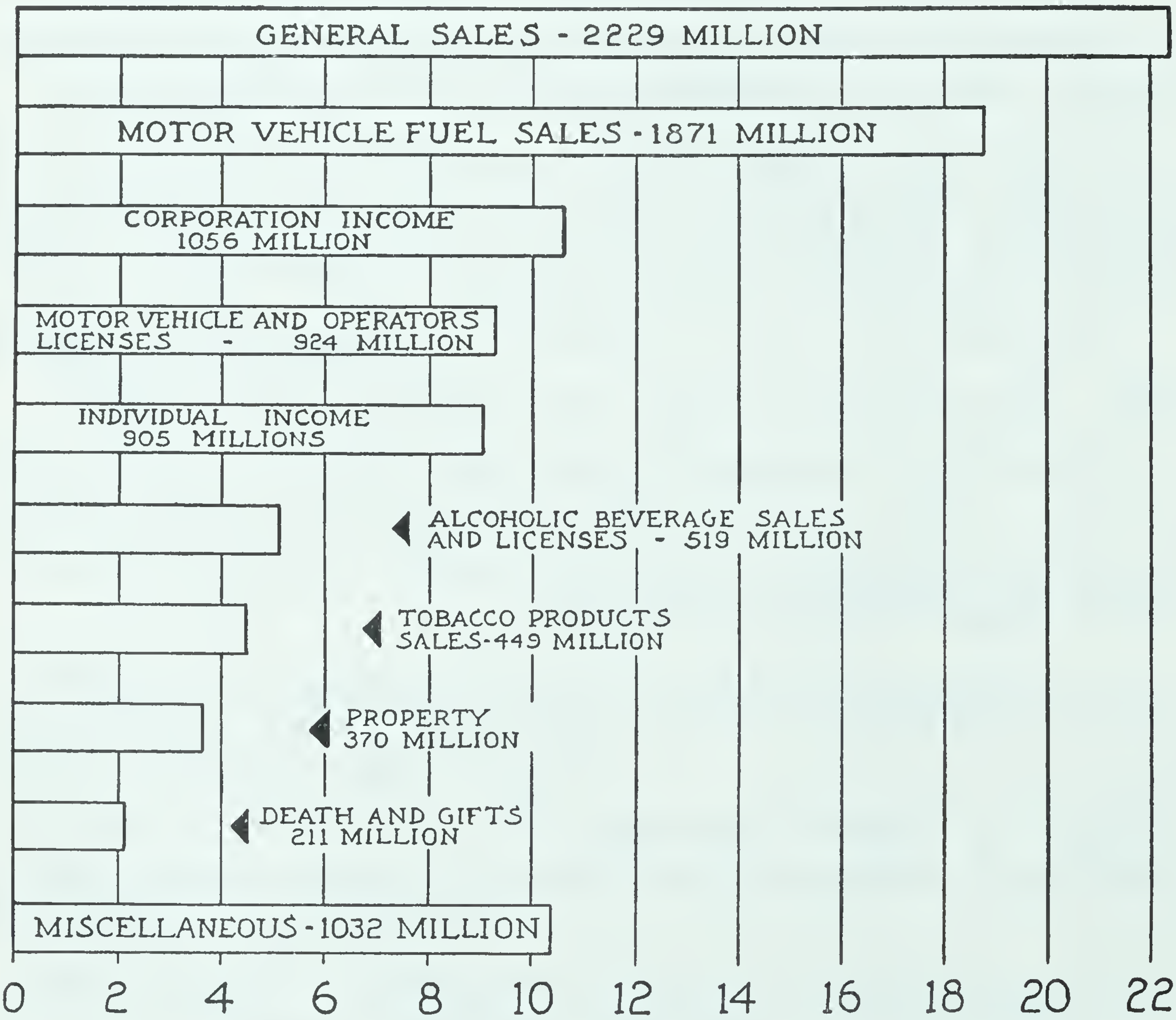
5. Cosmetics are taxed by the Federal government, and gasoline is taxed by both Federal and state governments. The consumer seldom knows how much this tax is; yet he pays it when he pays for the merchandise. It might be interesting to see how many purchasers of gasoline know that they pay from $3\frac{1}{2}$ to $8\frac{1}{2}$ cents tax on each gallon of gasoline. If the purchase price was 30 cents per gallon, what per cent of the purchase price is a tax of $3\frac{1}{2}$ cents a gallon? $8\frac{1}{2}$ cents? Make a list of other articles on which there are "hidden" taxes.

The sources of taxes are varied.

Although we pay a great many different taxes, we can put most of them into a few groups when we consider sources. The accompanying graph of state tax collections and the tables in the exercises which follow show the sources of taxes for our three levels of government. You will notice from these exercises that certain taxes, such as customs duties, produce revenue only for the Federal government. Others, such as property taxes, are collected by state and local governments only. Many taxes, however, yield revenue for all three levels of government. Do you think our tax scheme would be improved by having each source of tax revenue taxed by only one level of government? Why?

Estimated State Tax Collections by Sources, 1952

(Based on Bureau of Census figures)



Scale in hundred millions

ATTENTION OF TAXPAYERS
IMPORTANT

Ewing Galloway

Questions to Discuss and Things to Do

1. What was the total amount collected in taxes by states in 1952 from general sales, motor vehicle fuel sales, corporation income, motor vehicle and operators licenses, individual income, and alcoholic beverages? What per cent of the total collections came from these six sources?

2. The several sources of taxes vary from time to time in the per cent of total taxes yielded. The following table gives the amounts of state tax collections for the year 1942 and the per cent distribution for the year 1952. Convert the 1942 figures into per cents and compare your results with the 1952 per cents. Can you explain any of the variations?

Sources of State Taxes	1942 Amounts in Millions	1942 Per Cent	1952 Per Cent
General sales	$633	——	23
Motor vehicle fuel sales	942	——	19
Corporation income	269	——	11
Motor vehicle and operator licenses	431	——	9
Individual income	249	——	9
Alcoholic beverage sales and license	312	——	5
Tobacco-product sales	131	——	5
Property	271	——	4
Death and gift	112	——	2
Other	553	——	13
Totals	$3903	100	100

3. The sources and amounts of the Federal tax collections for 1942 and 1952 are indicated in the following table.

SOURCES OF FEDERAL TAXES

In millions of dollars

	1942	1952
Individual income	3,263	29,176
Corporation income and profits taxes	4,744	21,467
Employment (including social security)	1,185	4,562
Estate and gift	433	833
Alcoholic beverages	1,048	2,549
Tobacco	781	1,565
Excise and stamp taxes	894	2,909
Customs	355	551
Miscellaneous	682	1,947

Prepare a graph picturing the data above.

4. The figures in the above table indicate that Federal taxes increased greatly between 1942 and 1952, but some increased a great deal more than others. In each case compute the per cent of increase from 1942 to 1952 (nearest whole per cent).

5. Write to the Treasury Department, Washington, D. C., for a copy of the most recent issue of the *Monthly Bulletin of the Treasury Department.* From this get the most recent figures comparable to those given above for 1942 and 1952. Compare the data for the three years by a graph or other means.

6. The estimated tax collections by local governments in 1951 are indicated below.

Property taxes	$7.6 billion
Others	$1.0 billion

What per cent of local taxes came from property taxes in 1951?

Special investigation

7. Try to find the different sources of local tax income in your community and the amounts collected from each source during the past year. What per cent of the local tax revenue came from property taxes?

Tax collections fluctuate.

You have already seen how the amount of money produced from different tax sources varies from time to time. There are other important changes in tax collections that affect everyone. These are the differences among the increases and decreases in Federal, state, and local tax collections from year to year. As shown in the following table, the increase in local taxes exceeded the increases in both state and Federal taxes between 1925 and 1930, but the increases in Federal and state taxes greatly exceeded the increase in local taxes between 1930 and 1945.

TAX COLLECTIONS (EXCLUDING SOCIAL SECURITY)
In millions of dollars
(Sources: Tax Foundation, U. S. Bureau of the Census, and Treasury Department)

	FEDERAL	STATE	LOCAL
1925	2,966	1,107	3,811
1930	3,468	1,780	5,018
1935	3,545	1,886	4,299
1940	5,566	3,886	4,750
1945	40,900	4,300	4,900
1950	35,000	7,900	8,000

Problems to Solve and Things to Do

1. Read the table above and compute the per cent which local taxes were of Federal taxes in 1925; in 1930; in 1940; in 1945; in 1950.

2. Read the table above and compute the per cent which local taxes were of state taxes in 1925; in 1930; in 1940; in 1945; in 1950.

3. When 1940 unemployment taxes are deducted from state tax collections listed in the above table, $3042 million are left. What per cent increase is $3042 million over 1935 state collections of $1886 million when no unemployment taxes were collected by the states? Compare this with the increase in per cent of 1940 local taxes of $4750 million over 1935 local taxes of $4299 million. Now compute the per cent of increase in Federal tax collections in 1940 over 1935.

4. In the past the cost of public schools has been met more largely by local taxes than by state and Federal taxes. Localities with high incomes have had good schools, and localities with low incomes have had poor schools. How do the tax trends revealed in the preceding exercises indicate that the state and Federal governments may now help to provide good schools more uniformly?

5. Secure a copy of the last annual report of your State Commissioner of Education or State Commissioner of Roads. From this get information on the per cent of the cost of schools or roads which came from state taxes and from local taxes over the past ten years. Prepare a five-minute talk for your class on state and local finances in which you use these data.

6. Below are given the Bureau of Census figures on state property tax collections for alternate years from 1938 to 1952.

YEARS	MILLIONS OF DOLLARS	YEARS	MILLIONS OF DOLLARS
1938	244	**1946**	227
1940	260	**1948**	279
1942	271	**1950**	307
1944	247	**1952**	370

(*a*) How much did state property tax collections drop between 1942 and 1946?

(*b*) How much did state property tax collections increase between 1946 and 1952?

(*c*) Write to the Governments Division in the Bureau of the Census, Washington, D. C., for the most recent copy of *State Finances*. Find out from this bulletin what has happened to state property tax collections since 1952. See how your state compares with adjoining states on total collections.

(*d*) If possible, find out what changes have taken place in your local property tax collections over the last five to ten years. (Remember that changes in appraised values of properties may change tax revenues.)

PROBLEM II

How Much Income Tax Does a Person Pay?

Almost every Congress makes some changes in the income tax law. In general two kinds of changes are made: (*a*) rates may be increased or decreased or (*b*) exemptions may be increased or decreased. Either change affects the amount of tax a person must pay.

The income tax law requires each employed person (with certain exceptions) to pay the major portion of his income tax by having his employer hold back a specified amount from each pay period.

Withholding tax is obtained from a table.

The amount that is withheld each pay period for each wage earner is computed as follows:

Step 1. At the beginning of the year the employee fills out an *Employee's Withholding Exemption Certificate.* This certificate gives the employee an opportunity to list the total number of his withholding exemptions. (Each taxpayer is allowed an exemption for himself, one for his wife, and one for each additional dependent up to a total of ten, including the taxpayer.) The completed form is filed with his employer, and it serves as a guide for the employer in determining the proper amount to be withheld from the employee's earnings each payday.

Step 2. The employer uses the information on the *Employee's Withholding Exemption Certificate* and consults a table like the one shown on pages 356 and 357 to determine how much to withhold each payday. This particular table is based on weekly paydays, but there are similar tables available for other standard pay periods. (The zero column applies in the case of a man and wife who are both working and one claims exemptions for both of them. The other then cannot claim any exemption.)

Step 3. At the end of the year the employer must furnish each employee with a statement of the amount of wages earned by him and the amount of taxes withheld for him during the year.

Income Tax Withholding Table — 1952

Payroll Period is WEEKLY

And the wages are —		And the number of withholding exemptions claimed is —										
At least	But less than	0	1	2	3	4	5	6	7	8	9	10 or more
		The amount of tax to be withheld shall be —										
$0	$13	20% of wages	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	14	$2.70	.10	0	0	0	0	0	0	0	0	0
14	15	2.90	.30	0	0	0	0	0	0	0	0	0
15	16	3.10	.50	0	0	0	0	0	0	0	0	0
16	17	3.30	.70	0	0	0	0	0	0	0	0	0
17	18	3.50	.90	0	0	0	0	0	0	0	0	0
18	19	3.70	1.10	0	0	0	0	0	0	0	0	0
19	20	3.90	1.30	0	0	0	0	0	0	0	0	0
20	21	4.10	1.50	0	0	0	0	0	0	0	0	0
21	22	4.30	1.70	0	0	0	0	0	0	0	0	0
22	23	4.50	1.90	0	0	0	0	0	0	0	0	0
23	24	4.70	2.10	0	0	0	0	0	0	0	0	0
24	25	4.90	2.30	0	0	0	0	0	0	0	0	0
25	26	5.10	2.50	0	0	0	0	0	0	0	0	0
26	27	5.30	2.70	.20	0	0	0	0	0	0	0	0
27	28	5.50	2.90	.40	0	0	0	0	0	0	0	0
28	29	5.70	3.10	.60	0	0	0	0	0	0	0	0
29	30	5.90	3.30	.80	0	0	0	0	0	0	0	0
30	31	6.10	3.50	1.00	0	0	0	0	0	0	0	0
31	32	6.30	3.70	1.20	0	0	0	0	0	0	0	0
32	33	6.50	3.90	1.40	0	0	0	0	0	0	0	0
33	34	6.70	4.10	1.60	0	0	0	0	0	0	0	0
34	35	6.90	4.30	1.80	0	0	0	0	0	0	0	0
35	36	7.10	4.50	2.00	0	0	0	0	0	0	0	0
36	37	7.30	4.70	2.20	0	0	0	0	0	0	0	0
37	38	7.50	4.90	2.40	0	0	0	0	0	0	0	0
38	39	7.70	5.10	2.60	0	0	0	0	0	0	0	0
39	40	7.90	5.30	2.80	.20	0	0	0	0	0	0	0
40	41	8.10	5.50	3.00	.40	0	0	0	0	0	0	0
41	42	8.30	5.70	3.20	.60	0	0	0	0	0	0	0
42	43	8.50	5.90	3.40	.80	0	0	0	0	0	0	0
43	44	8.70	6.10	3.60	1.00	0	0	0	0	0	0	0
44	45	8.90	6.30	3.80	1.20	0	0	0	0	0	0	0
45	46	9.10	6.50	4.00	1.40	0	0	0	0	0	0	0
46	47	9.30	6.70	4.20	1.60	0	0	0	0	0	0	0
47	48	9.50	6.90	4.40	1.80	0	0	0	0	0	0	0
48	49	9.70	7.10	4.60	2.00	0	0	0	0	0	0	0
49	50	9.90	7.30	4.80	2.20	0	0	0	0	0	0	0
50	51	10.10	7.50	5.00	2.40	0	0	0	0	0	0	0
51	52	10.30	7.70	5.20	2.60	0	0	0	0	0	0	0
52	53	10.50	7.90	5.40	2.80	.20	0	0	0	0	0	0
53	54	10.70	8.10	5.60	3.00	.40	0	0	0	0	0	0
54	55	10.90	8.30	5.80	3.20	.60	0	0	0	0	0	0

INCOME TAX WITHHOLDING TABLE — 1952 (*Concluded*)

Payroll Period is WEEKLY

And the wages are —		And the number of withholding exemptions claimed is —										
At least	But less than	0	1	2	3	4	5	6	7	8	9	10 or more
		The amount of tax to be withheld shall be —										
55	56	$11.10	$8.50	$6.00	$3.40	$ .80	$0	$0	$0	$0	$0	$0
56	57	11.30	8.70	6.20	3.60	1.00	0	0	0	0	0	0
57	58	11.50	8.90	6.40	3.80	1.20	0	0	0	0	0	0
58	59	11.70	9.10	6.60	4.00	1.40	0	0	0	0	0	0
59	60	11.90	9.30	6.80	4.20	1.60	0	0	0	0	0	0
60	62	12.20	9.60	7.10	4.50	1.90	0	0	0	0	0	0
62	64	12.60	10.00	7.50	4.90	2.30	0	0	0	0	0	0
64	66	13.00	10.40	7.90	5.30	2.70	.20	0	0	0	0	0
66	68	13.40	10.80	8.30	5.70	3.10	.60	0	0	0	0	0
68	70	13.80	11.20	8.70	6.10	3.50	1.00	0	0	0	0	0
70	72	14.20	11.60	9.10	6.50	3.90	1.40	0	0	0	0	0
72	74	14.60	12.00	9.50	6.90	4.30	1.80	0	0	0	0	0
74	76	15.00	12.40	9.90	7.30	4.70	2.20	0	0	0	0	0
76	78	15.40	12.80	10.30	7.70	5.10	2.60	0	0	0	0	0
78	80	15.80	13.20	10.70	8.10	5.50	3.00	.40	0	0	0	0
80	82	16.20	13.60	11.10	8.50	5.90	3.40	.80	0	0	0	0
82	84	16.60	14.00	11.50	8.90	6.30	3.80	1.20	0	0	0	0
84	86	17.00	14.40	11.90	9.30	6.70	4.20	1.60	0	0	0	0
86	88	17.40	14.80	12.30	9.70	7.10	4.60	2.00	0	0	0	0
88	90	17.80	15.20	12.70	10.10	7.50	5.00	2.40	0	0	0	0
90	92	18.20	15.60	13.10	10.50	7.90	5.40	2.80	.30	0	0	0
92	94	18.60	16.00	13.50	10.90	8.30	5.80	3.20	.70	0	0	0
94	96	19.00	16.40	13.90	11.30	8.70	6.20	3.60	1.10	0	0	0
96	98	19.40	16.80	14.30	11.70	9.10	6.60	4.00	1.50	0	0	0
98	100	19.80	17.20	14.70	12.10	9.50	7.00	4.40	1.90	0	0	0
100	105	20.50	17.90	15.40	12.80	10.20	7.70	5.10	2.60	0	0	0
105	110	21.50	18.90	16.40	13.80	11.20	8.70	6.10	3.60	1.00	0	0
110	115	22.50	19.90	17.40	14.80	12.20	9.70	7.10	4.60	2.00	0	0
115	120	23.50	20.90	18.40	15.80	13.20	10.70	8.10	5.60	3.00	.40	0
120	125	24.50	21.90	19.40	16.80	14.20	11.70	9.10	6.60	4.00	1.40	0
125	130	25.50	22.90	20.40	17.80	15.20	12.70	10.10	7.60	5.00	2.40	0
130	135	26.50	23.90	21.40	18.80	16.20	13.70	11.10	8.60	6.00	3.40	.90
135	140	27.50	24.90	22.40	19.80	17.20	14.70	12.10	9.60	7.00	4.40	1.90
140	145	28.50	25.90	23.40	20.80	18.20	15.70	13.10	10.60	8.00	5.40	2.90
145	150	29.50	26.90	24.40	21.80	19.20	16.70	14.10	11.60	9.00	6.40	3.90
150	160	31.00	28.40	25.90	23.30	20.70	18.20	15.60	13.10	10.50	7.90	5.40
160	170	33.00	30.40	27.90	25.30	22.70	20.20	17.60	15.10	12.50	9.90	7.40
170	180	35.00	32.40	29.90	27.30	24.70	22.20	19.60	17.10	14.50	11.90	9.40
180	190	37.00	34.40	31.90	29.30	26.70	24.20	21.60	19.10	16.50	13.90	11.40
190	200	39.00	36.40	33.90	31.30	28.70	26.20	23.60	21.10	18.50	15.90	13.40
$200 and over		20 per cent of the excess over $200 plus —										
		40.00	37.40	34.90	32.30	29.70	27.20	24.60	22.10	19.50	16.90	14.40

Problems to Solve

Use the table on pages 356 and 357 to help solve these problems.

1. After she was graduated from high school Mary Carson worked as a stenographer at $30 a week. What is the amount of tax her employer must withhold weekly if she claims one exemption (herself)? What are Mary's yearly withholdings?

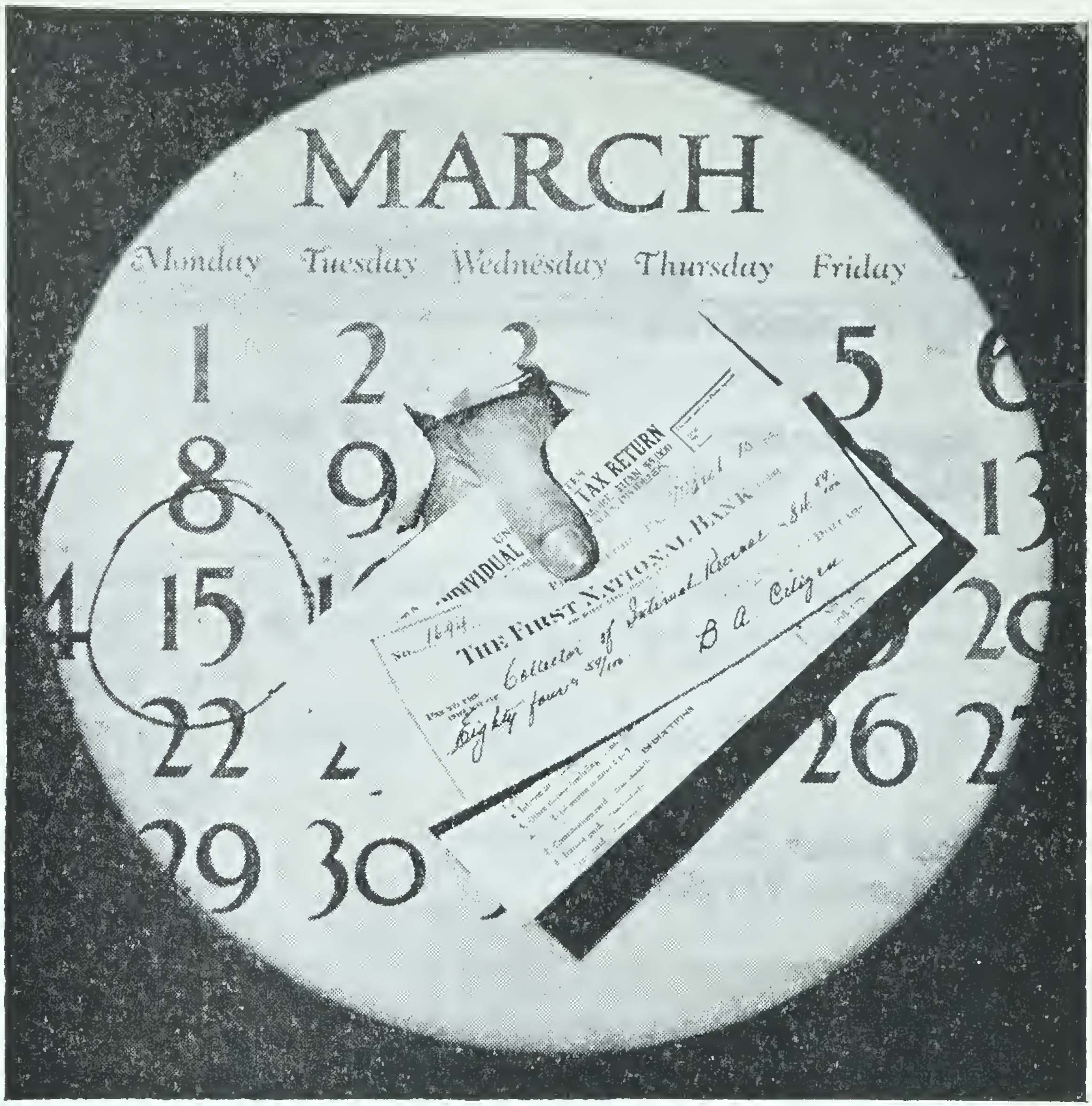
2. Alice Penny works in the office of the Universal Pump Company. She helps with the payroll and therefore must compute the withholding tax and the amount left to be paid each employee each week. Make the following computations as Alice made them. The first one is completed for you.

NAME	WEEKLY WAGE	NUMBER OF EXEMPTIONS	TAX WITHHELD	AMOUNT IN PAY ENVELOPE
Agnes Liptak	$30.15	0	$6.10	$24.05
W. A. Ayers	43.56	2	—	—
Sarah Cushwa	39.71	1	—	—
John L. McDowell	65.16	3	—	—
P. S. Einstein	44.00	3	—	—
Juliett Wingold	40.06	2	—	—
Margaret Daughtery	41.09	2	—	—
Robert Starling	71.20	5	—	—
Jane Driskill	58.93	3	—	—
M. B. Beazley	49.98	3	—	—
Richard Yoder	54.16	2	—	—

3. Irwin Tuttle worked 23 weeks for the Honeybread Baking Company at $52.18 a week and 29 weeks for the Variety Grocery Company at $57.58 a week. What was the total annual amount of withholding tax for him if he claimed two exemptions?

4. Mr. and Mrs. Alex Critzer both work. Mrs. Critzer earns $38.17 and Mr. Critzer earns $67.21 weekly. What is the yearly withholding tax for each if each claims one exemption? What would be the yearly withholding from Mr. Critzer's wages if he claimed both exemptions? from Mrs. Critzer's wages if she claimed none? What is the total difference in withholding tax under the two systems of computation?

March 15 is the deadline for paying income tax for the first quarter of the year. The annual tax return must be submitted at the same time.


MARCH
Monday Tuesday Wednesday Thursday Friday
INDIVIDUAL TAX RETURN
THE FIRST NATIONAL BANK
Collector of Internal Revenue
Eighty four 59/100
B. A. Citizen

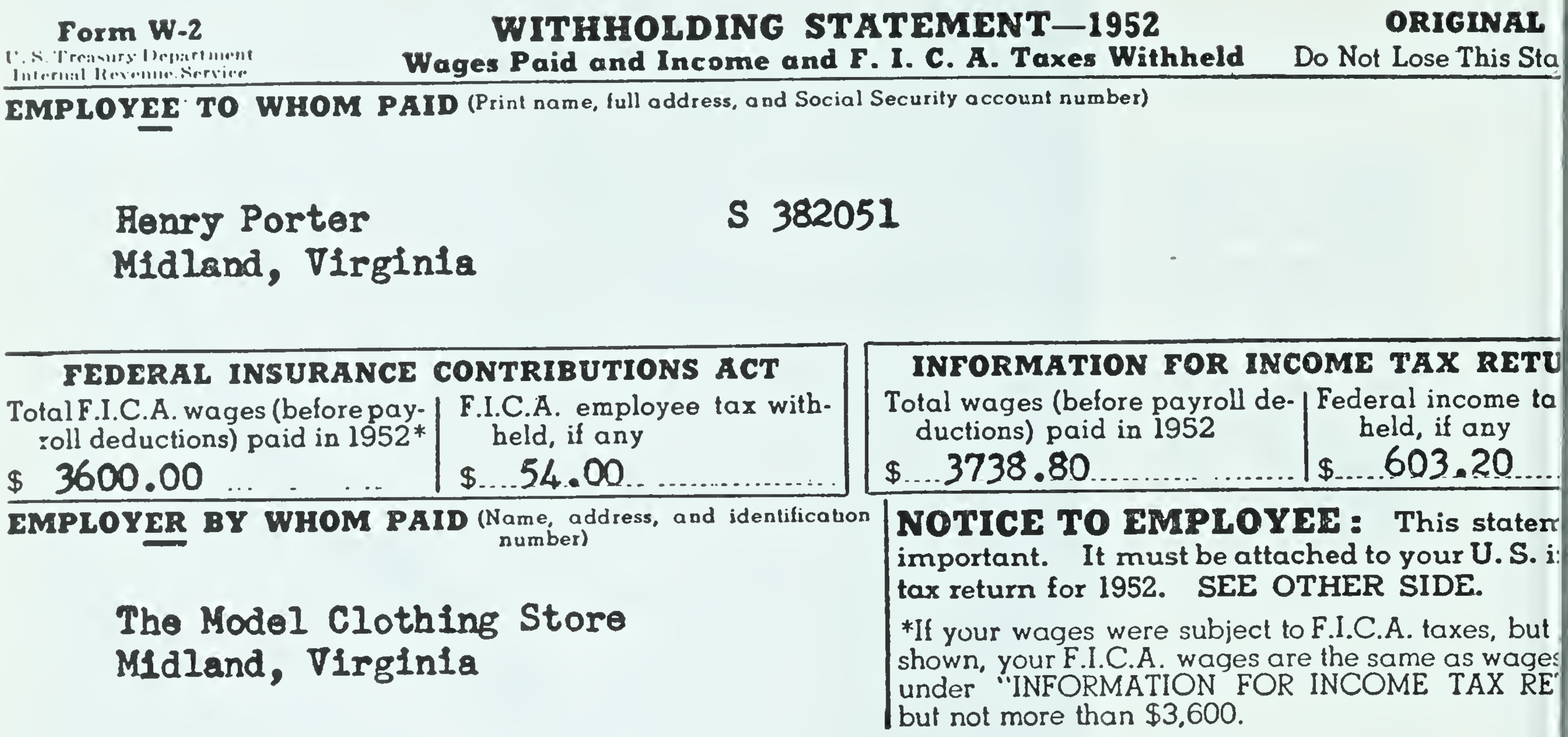
Harold M. Lambert from Frederic Lewis

Most persons use the short form income tax return.

At the end of the year the employer sends to the Director of Internal Revenue a statement of total wages and taxes withheld for each employee. And each person who earned $600 or more during the preceding year must send to the Director of Internal Revenue his own statement of income tax return (a statement of income received, tax withheld, deductions claimed, etc.).

A person receiving less than $5000 in the preceding year may use a short form on which to file his statement of income for tax purposes. Other persons must use a longer and more detailed form. A person receiving less than $5000 in the preceding year may use the long form if he wishes. For example, it may be desirable to use the long form if the person has local taxes and interest on a home mortgage that are more than 10% of his income.

The way in which the income tax is computed under the short form is described first. (The 1952 rates are used throughout.)



Form W-2
U. S. Treasury Department
Internal Revenue Service

WITHHOLDING STATEMENT—1952
Wages Paid and Income and F. I. C. A. Taxes Withheld

ORIGINAL
Do Not Lose This Sta

EMPLOYEE TO WHOM PAID (Print name, full address, and Social Security account number)

Henry Porter S 382051
Midland, Virginia

FEDERAL INSURANCE CONTRIBUTIONS ACT

Total F.I.C.A. wages (before payroll deductions) paid in 1952*	F.I.C.A. employee tax withheld, if any
$ 3600.00	$ 54.00

INFORMATION FOR INCOME TAX RETU

Total wages (before payroll deductions) paid in 1952	Federal income ta held, if any
$ 3738.80	$ 603.20

EMPLOYER BY WHOM PAID (Name, address, and identification number)

The Model Clothing Store
Midland, Virginia

NOTICE TO EMPLOYEE: This statem important. It must be attached to your U. S. i tax return for 1952. SEE OTHER SIDE.

*If your wages were subject to F.I.C.A. taxes, but shown, your F.I.C.A. wages are the same as wage under "INFORMATION FOR INCOME TAX RE but not more than $3,600.

Henry Porter worked as a clerk in a store during 1952. His employer withheld from his weekly wages of $71.90 the amount of $11.60 for taxes. The withholding tax table on pages 356 and 357 was used by Henry's employer in arriving at this amount. His employer also computed the total annual withholding.

Henry received the above withholding receipt (and a duplicate) from his employer at the end of the year. On this receipt his employer has indicated Henry's social security number, wages, social security taxes, and income taxes withheld. You will remember from your study of social security benefits in the last chapter that the social security tax for employees is paid only on $3600 of a person's yearly wages.

After receiving this withholding statement, Henry filed his income tax return with the nearest office of the Director of Internal Revenue. He chose to use the so-called "short form" for filing a return. On this he simply filled in his name, address, the amount of his wages for the year, and the amount of taxes withheld. From a table like the one on the following page the director computed the total tax Henry was required to pay.

Since Henry was unmarried and had no dependents, he was allowed only one exemption. With an income for the year between $3700 and $3750, the table shows Henry's income tax for the year to be $629. Since only $603.20 has been withheld by his employer, Henry received a bill from the office of the Director of Internal Revenue in the amount of \$629.00 – \$603.20, or _?_, for additional taxes.

1952 TAX TABLE — FOR INCOMES UNDER \$5000

If your income (**item 4**, page **1**, Form **1040**) is —		And the number of your **1952** exemptions is —			
At least	But less than	1	2	3	4 or more
		Your tax is —			
\$0	\$675	\$0	\$0	\$0	\$0
675	700	4	0	0	0
700	725	9	0	0	0
725	750	14	0	0	0
750	775	19	0	0	0
775	800	24	0	0	0
800	825	29	0	0	0
825	850	34	0	0	0
850	875	39	0	0	0
875	900	44	0	0	0
900	925	49	0	0	0
925	950	54	0	0	0
950	975	59	0	0	0
975	1,000	64	0	0	0
1,000	1,025	69	0	0	0
1,025	1,050	74	0	0	0
1,050	1,075	79	0	0	0
1,075	1,100	84	0	0	0
1,100	1,125	89	0	0	0
1,125	1,150	94	0	0	0
1,150	1,175	99	0	0	0
1,175	1,200	104	0	0	0
1,200	1,225	109	0	0	0
1,225	1,250	114	0	0	0
1,250	1,275	119	0	0	0
1,275	1,300	124	0	0	0
1,300	1,325	129	0	0	0
1,325	1,350	134	1	0	0
1,350	1,375	139	6	0	0
1,375	1,400	144	11	0	0
1,400	1,425	149	16	0	0
1,425	1,450	154	21	0	0
1,450	1,475	159	26	0	0
1,475	1,500	164	31	0	0
1,500	1,525	169	36	0	0
1,525	1,550	174	41	0	0
1,550	1,575	179	46	0	0
1,575	1,600	184	51	0	0
1,600	1,625	189	56	0	0
1,625	1,650	194	61	0	0
1,650	1,675	199	66	0	0
1,675	1,700	204	71	0	0
1,700	1,725	209	76	0	0
1,725	1,750	214	81	0	0
1,750	1,775	219	86	0	0
1,775	1,800	224	91	0	0
1,800	1,825	229	96	0	0
1,825	1,850	234	101	0	0
1,850	1,875	239	106	0	0
1,875	1,900	244	111	0	0
1,900	1,925	249	116	0	0
1,925	1,950	254	121	0	0
1,950	1,975	259	126	0	0
1,975	2,000	264	131	0	0
2,000	2,025	269	136	2	0
2,025	2,050	274	141	7	0
2,050	2,075	279	146	12	0
2,075	2,100	284	151	17	0
2,100	2,125	289	156	22	0
2,125	2,150	294	161	27	0
2,150	2,175	299	166	32	0
2,175	2,200	304	171	37	0
2,200	2,225	309	176	42	0
2,225	2,250	314	181	47	0
2,250	2,275	319	186	52	0
2,275	2 300	324	191	57	0
2,300	2,325	329	196	62	0

If your income (**item 4**, page **1**, Form **1040**) is —		And the number of your **1952** exemptions is —							
At least	But less than	1[1]	2[1]	3[1]	4	5	6	7	8 or more
		Your tax is —							
\$2,325	\$2,350	\$334	\$201	\$67	\$0	\$0	\$0	\$0	\$0
2,350	2,375	339	206	72	0	0	0	0	0
2,375	2,400	344	211	77	0	0	0	0	0
2,400	2,425	349	216	82	0	0	0	0	0
2,425	2,450	354	221	87	0	0	0	0	0
2,450	2,475	359	226	92	0	0	0	0	0
2,475	2,500	364	231	97	0	0	0	0	0
2,500	2,525	369	236	102	0	0	0	0	0
2,525	2,550	374	241	107	0	0	0	0	0
2,550	2,575	379	246	112	0	0	0	0	0
2,575	2,600	384	251	117	0	0	0	0	0
2,600	2,625	389	256	122	0	0	0	0	0
2,625	2,650	394	261	127	0	0	0	0	0
2,650	2,675	399	266	132	0	0	0	0	0
2,675	2,700	404	271	137	4	0	0	0	0
2,700	2,725	409	276	142	9	0	0	0	0
2,725	2,750	414	281	147	14	0	0	0	0
2,750	2,775	419	286	152	19	0	0	0	0
2,775	2,800	424	291	157	24	0	0	0	0
2,800	2,825	429	296	162	29	0	0	0	0
2,825	2,850	434	301	167	34	0	0	0	0
2,850	2,875	439	306	172	39	0	0	0	0
2,875	2,900	444	311	177	44	0	0	0	0
2,900	2,925	449	316	182	49	0	0	0	0
2,925	2,950	455	321	187	54	0	0	0	0
2,950	2,975	460	326	192	59	0	0	0	0
2,975	3,000	466	331	197	64	0	0	0	0
3,000	3,050	474	338	205	72	0	0	0	0
3,050	3,100	485	348	215	82	0	0	0	0
3,100	3,150	496	358	225	92	0	0	0	0
3,150	3,200	507	368	235	102	0	0	0	0
3,200	3,250	518	378	245	112	0	0	0	0
3,250	3,300	529	388	255	122	0	0	0	0
3,300	3,350	541	398	265	132	0	0	0	0
3,350	3,400	552	408	275	142	8	0	0	0
3,400	3,450	563	418	285	152	18	0	0	0
3,450	3,500	574	428	295	162	28	0	0	0
3,500	3,550	585	438	305	171	38	0	0	0
3,550	3,600	596	448	315	181	48	0	0	0
3,600	3,650	607	458	325	191	58	0	0	0
3,650	3,700	618	468	335	201	68	0	0	0
3,700	3,750	629	478	345	211	78	0	0	0
3,750	3,800	640	488	355	221	88	0	0	0
3,800	3,850	651	498	365	231	98	0	0	0
3,850	3,900	662	508	375	241	108	0	0	0
3,900	3,950	673	518	385	251	118	0	0	0
3,950	4,000	684	528	395	261	128	0	0	0
4,000	4,050	696	538	405	271	138	5	0	0
4,050	4,100	707	548	415	281	148	15	0	0
4,100	4,150	718	558	425	291	158	25	0	0
4,150	4,200	729	568	435	301	168	35	0	0
4,200	4,250	740	578	445	311	178	45	0	0
4,250	4,300	751	588	455	321	188	55	0	0
4,300	4,350	762	598	465	331	198	65	0	0
4,350	4,400	773	608	475	341	208	75	0	0
4,400	4,450	784	618	485	351	218	85	0	0
4,450	4,500	795	628	495	361	228	95	0	0
4,500	4,550	806	638	504	371	238	105	0	0
4,550	4,600	817	648	514	381	248	115	0	0
4,600	4,650	828	658	524	391	258	125	0	0
4,650	4,700	839	668	534	401	268	135	2	0
4,700	4,750	851	678	544	411	278	145	12	0
4,750	4,800	862	688	554	421	288	155	22	0
4,800	4,850	873	698	564	431	298	165	32	0
4,850	4,900	884	708	574	441	308	175	42	0
4,900	4,950	895	718	584	451	318	185	52	0
4,950	5,000	906	728	594	461	328	195	62	0

[1] TO THE TEACHER. The official form contains additional columns for 1, 2, or 3 exemptions based on separate returns and heads of households for annual salaries above \$2925.

Problems to Solve

Use the tables on pages 356, 357, *and* 361 *for these problems.*

1. For each of the following persons find the total withholdings for a year of 52 weeks. Find the total tax required and the amount of rebate due or the amount of additional tax due.

Taxpayer	Exemptions	Weekly Wages	Taxpayer	Exemptions	Weekly Wages
(*a*) Charles Maneyer	3	$45.90	(*d*) Henry Allport	4	$83.40
(*b*) Sarah Allen	1	32.50	(*e*) Sam Andrews	3	79.20
(*c*) Nina Shores	1	46.15	(*f*) Phyllis Morse	4	91.80

2. Carol Jacobs gets $35.75 a week, working in the package department of a grocery store. She supports her widowed mother and hence can claim two withholding exemptions. What is her weekly withholding tax? How much does this amount to in a year?

3. How much was the total tax Carol was required to pay? Is this more or less than the total amount withheld by the employer? How much?

4. Mr. Street is married and has two young children. He, therefore, can claim four exemptions. He is a foreman in his plant and earns $57 a week. What is the amount of tax withheld weekly by his employer? How much does this amount to in a year?

5. Mr. Street has invested his savings in the stock of his company. He has been getting $75 a year in dividends from this investment. What is his total annual income? How much tax must he pay? Is this more or less than the amount withheld by his employer, and how much?

6. Billy Jarman works after school and on Saturdays and earns $15 a week. Since this makes his annual income more than $600, he must file an income tax statement. How much is his annual tax?

7. If Billy had not worked, Mr. Jarman could have claimed five exemptions on his income of $4850. How much greater are Mr. Jarman's taxes if Billy pays an income tax?

Tables help in computing graduated rate taxes.

Earlier in this unit you learned the difference between taxes paid at a graduated, or progressive, rate and taxes paid at a fixed rate. You also saw that there are a number of taxes under each of these types. For example, the individual tax on income, corporation income, estate, and gift taxes of the Federal government are all graduated rate taxes, whereas sales and property taxes are fixed rate taxes. Of course, most persons who pay large amounts of graduated rate taxes employ a lawyer or a tax specialist to assist them in making out their tax returns.

In 1952 all persons with annual net incomes exceeding $5000 were required to use the "long form" of tax return. The long form was optional for persons with lower net incomes. Tables are a great help in computing taxes at graduated rates. Even the tax specialists find that graduated rate taxes are tedious to compute without the aid of tables. This will be clear if, without the use of a table, we try to compute the tax on a net income of $19,500 according to the 1952 rates. Here is the way the computation would be made:

22.2% on first	$2000	$444.00	42% on next	$2000	$840.00
24.6% on next	2000	492.00	48% on next	2000	960.00
29% on next	2000	580.00	53% on next	2000	1060.00
34% on next	2000	680.00	56% on next	2000	1120.00
38% on next	2000	760.00	59% on next	1500	885.00
				Total tax,	$7821.00

Now, if the table on page 364 is used, we follow these steps: (*a*) Note that $19,500 comes between $18,000 and $20,000. (*b*) The amount of tax to be paid is read as $6936 plus 59% of all over $18,000.

In this instance, $19,500 − $18,000 = $1500

And .59 × $1500 = $885

Then $6936 + $885 = $?.

INCOME TAX RATE SCHEDULE

If the net income is:	The income tax shall be:
Not over $2,000	22.2% of the amount of net income.
Over $2,000 but not over $4,000	$444, plus 24.6% of excess over $2,000.
Over $4,000 but not over $6,000	$936, plus 29% of excess over $4,000.
Over $6,000 but not over $8,000	$1,516, plus 34% of excess over $6,000.
Over $8,000 but not over $10,000	$2,196, plus 38% of excess over $8,000.
Over $10,000 but not over $12,000	$2,956, plus 42% of excess over $10,000.
Over $12,000 but not over $14,000	$3,796, plus 48% of excess over $12,000.
Over $14,000 but not over $16,000	$4,756, plus 53% of excess over $14,000.
Over $16,000 but not over $18,000	$5,816, plus 56% of excess over $16,000.
Over $18,000 but not over $20,000	$6,936, plus 59% of excess over $18,000.
Over $20,000 but not over $22,000	$8,116, plus 62% of excess over $20,000.
Over $22,000 but not over $26,000	$9,356, plus 66% of excess over $22,000.
Over $26,000 but not over $32,000	$11,996, plus 67% of excess over $26,000.
Over $32,000 but not over $38,000	$16,016, plus 68% of excess over $32,000.
Over $38,000 but not over $44,000	$20,096, plus 72% of excess over $38,000.
Over $44,000 but not over $50,000	$24,416, plus 75% of excess over $44,000.
Over $50,000 but not over $60,000	$28,916, plus 77% of excess over $50,000.
Over $60,000 but not over $70,000	$36,616, plus 80% of excess over $60,000.
Over $70,000 but not over $80,000	$44,616, plus 83% of excess over $70,000.
Over $80,000 but not over $90,000	$52,916, plus 85% of excess over $80,000.
Over $90,000 but not over $100,000	$61,416, plus 88% of excess over $90,000.
Over $100,000 but not over $150,000	$70,216, plus 90% of excess over $100,000.
Over $150,000 but not over $200,000	$115,216, plus 91% of excess over $150,000.
Over $200,000	$160,716, plus 92% of excess over $200,000.

Problems to Solve

1. Use the rate schedule above to find the amount of tax on the following incomes of unmarried persons without dependents:

(*a*) $2300
(*b*) $4000
(*c*) $9400
(*d*) $1500
(*e*) $3250
(*f*) $20,000
(*g*) $14,200
(*h*) $17,800
(*i*) $87,000
(*j*) $123,000

2. In 1952 a man and wife, filing a tax return jointly, were allowed to divide their joint income (after deductions and exemptions) by 2 before computing the tax. Thus a joint taxable income of $7600 would have a tax as follows:

$7600 ÷ 2 = $\underline{\ ?\ }$. From the table a tax on $3800 equals $444 + 24.6% of ($3800 − $2000).

$444 + $442.80 = $\underline{\ ?\ }$. Now this amount must be multiplied by 2 to find the tax on the joint income of $7600.

2 × $886.80 = $\underline{\ ?\ }$.

3. Find the tax on the following joint incomes (after deductions and exemptions):

(*a*) $5400
(*b*) $8200
(*c*) $9200
(*d*) $7800
(*e*) $10,000
(*f*) $16,500

4. The donor of gifts pays a Federal tax only if his gifts exceed $30,000. For example, the taxable portion, or *net gift,* of a $32,000 gift is $2000. The first part of a 1952 gifts tax table looks like this:

AMOUNT OF NET GIFTS		AMOUNT OF GIFTS TAX		
Over	Not over	Minimum tax	Rate	On excess over
0	$5,000	—	$2\frac{1}{4}\%$	—
$5,000	10,000	$112.50	$5\frac{1}{4}\%$	$5,000
10,000	20,000	375.00	$8\frac{1}{4}\%$	10,000
20,000	30,000	1200.00	$10\frac{1}{2}\%$	20,000
30,000	40,000	2250.00	$13\frac{1}{2}\%$	30,000
40,000	50,000	3600.00	$16\frac{1}{2}\%$	40,000
50,000	60,000	5250.00	$18\frac{3}{4}\%$	50,000
60,000	100,000	7125.00	21%	60,000

Compute the amount of gifts tax on the following net gifts:

(*a*) $10,000
(*b*) $23,000
(*c*) $27,500
(*d*) $44,600
(*e*) $2700
(*f*) $93,000
(*g*) $75,000
(*h*) $38,500

5. The corporation income tax table (1952) is as follows:

CORPORATION TAX

NET INCOME	RATE
Up to $25,000	30%
Over $25,000	$7500 plus 52% of amount over $25,000

Find the corporation income tax on the following net incomes:

(*a*) $3800
(*b*) $20,000
(*c*) $17,000
(*d*) $28,000
(*e*) $39,500
(*f*) $55,000
(*g*) $37,000
(*h*) $13,200

The long form income tax return is optional for most persons but required of others.

The long 1952 form for making income tax returns is similar to those which preceded it. Changes are likely each year, but if you understand how to use that form you will have no difficulty in following whatever form is in current use. Some persons in the lower income brackets but with large deductible expenses found it desirable to use the long form. Essentially there are three steps involved in making out an income tax return on the long form for 1952.

Step 1. All income from whatever source must be listed.

Step 2. Deductions allowed are subtracted from the total income. These deductions include gifts to charitable or religious organizations, interest paid on loans, certain Federal taxes already paid, and similar items. If the individual wishes to avoid considerable work in locating receipts, he may make a *standard deduction* of 10% of his gross income, but not more than $1000, in place of the actual deductions for these various items. An additional deduction of $600 for the person submitting the tax return and for each dependent is allowed on the total income.

Step 3. The amount of tax on total income less deductions is computed. This is done by using a progressive rate table like that on page 364.

Anton Kamp from Frederic Lewis

Many a distracted parent has burned the midnight oil over his income tax returns. Could you be a help to your parents?

Let us follow these three steps with Mr. and Mrs. Paul Thomson as they make a joint income tax return. They have two dependent children.

Step 1.	Income		
	Salary	$8350.00	
	Dividends	215.75	
	Rent	360.00	
	Total income for year		$8925.75
Step 2.	Deductions		
	Standard deduction	$ 892.58	
	Exemption ($600 for each of 4 persons in family)	2400.00	
	Total deduction		$3292.58
	Taxable income (Difference between total income and deductions)		$5633.17
Step 3.	Tax computation		
	Taxable income divided by 2 (½ of $5633.17)		$2816.58
	Amount of tax (On $2816.58 from table, page 364)		
	First $2000	$ 444.00	
	Next $816.58 at 24.6%	200.88	
	Total		$ 644.88
	Total tax (2 × $644.88)		1289.76
	Withheld by employer (On $160 + a week from table, page 357)	$1180.40	
	Payments on estimated tax [1]	92.60	
	Total payments		$1273.00
	Amount of tax due		$ 16.76

---

[1] (*a*) Anyone receiving wages (subject to withholding) in excess of $4500 plus $600 for each dependent and himself, and (*b*) anyone receiving other income (not subject to withholding) in excess of $100 must file a declaration of estimated income tax for the ensuing year. There is a fine for underestimating the ultimate tax by more than 20%. In general, the estimated tax may be computed as though all income were from wages. In this case, Mr. Thomson estimated a total income from all sources of $8850, and on this basis he must pay taxes on $5565. Following the process indicated in Step 3, his estimated tax is $1273.00. Since his employer will withhold $1180.40 from payroll, Mr. Thomson must pay $1273.00 − $1180.40 = $92.60 in addition to the amount withheld. He may pay the amount in one lump or in quarterly payments during the year.

Problems to Solve

Use the table on page 364 in computing the tax for these problems. Also assume that the *standard deduction* of 10% of gross income not to exceed $1000 was taken in each case.

1. John Welch has a total yearly income of $2400. He is unmarried and has no dependents. What income tax did he pay?

2. Miss Craft is a teacher and gets $4200. She has no dependents. What income tax did she pay?

3. Paul Holmes's salary is $4600. He sold property last year on which he made a profit of $600. On another piece of property he received rent of $480. He has a wife and two dependent children. How much income tax did he pay? (Use joint return.)

4. Mr. Sam Hurley is a writer. He received an annual salary of $6800 for his daily news column. Royalties from books amounted to $1200, and he received $236 in dividends. He and his wife file a joint return. They have one dependent child. What amount of income tax did he pay?

5. Carrie Nash earned $50 a week and got $60 a month rent on property left her by her father. She had no dependents. How much income tax did she pay? How much was withheld from her wages? (Use table on page 356.) How much additional did she have to pay?

Ewing Galloway

City tax bills are calculated in and mailed from either the comptroller's or the treasurer's department. Here the assessment records are kept in large books which are filed by wards. Individual taxpayers may apply to the comptroller's office for adjustments or information.

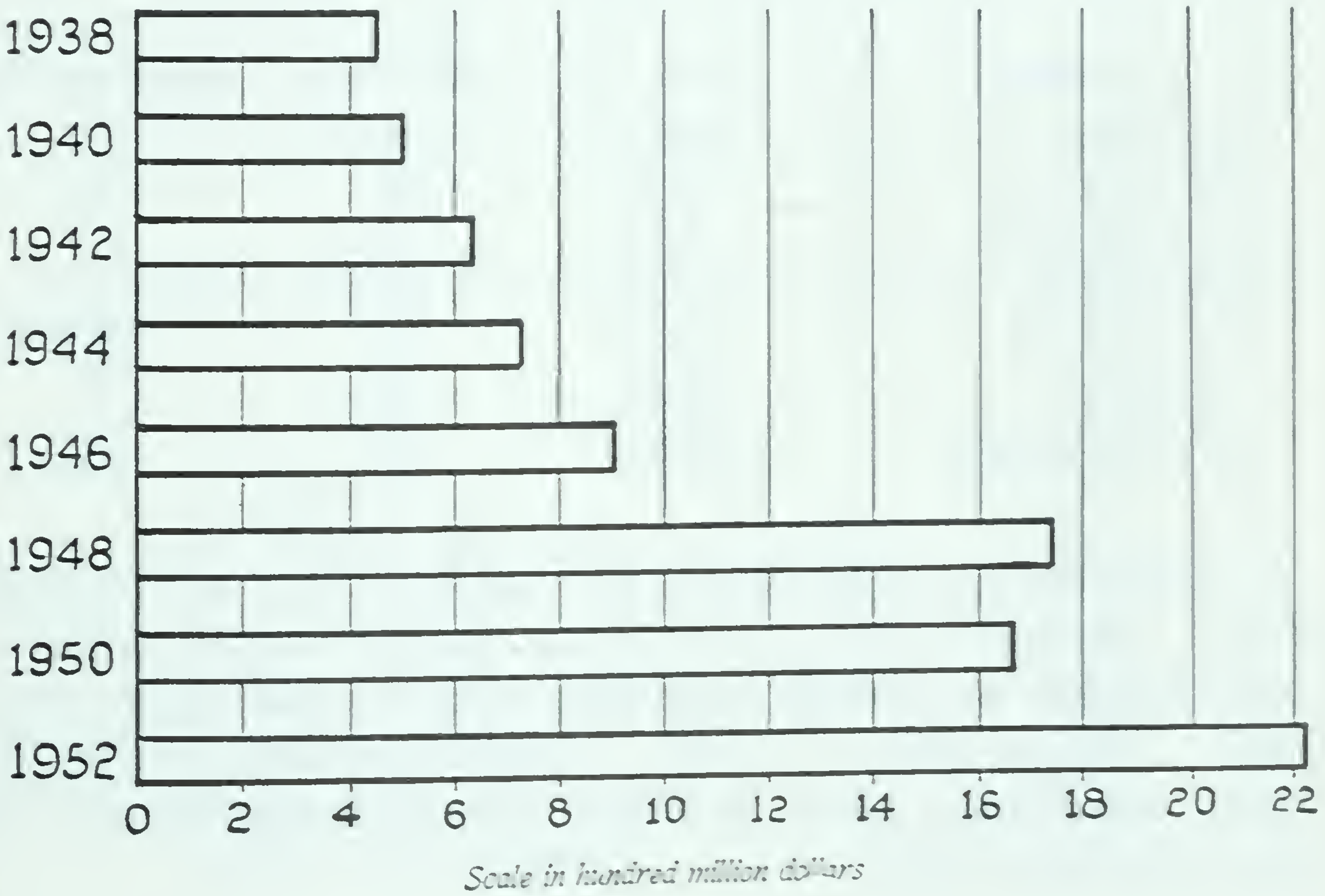
PROBLEM III

What Are Sales Taxes?

Taxes on sales of goods and services have been used for a long time by the Federal government. Taxes on cigarettes and liquors are examples of long-standing sales taxes.

During the 1930's, a "general" sales tax came into existence in many states as an attempt to raise much-needed money for relief during the depression. In 1930 only two states had taxes on retail sales and only $1.2 million was collected from this source. By 1936 there were 22 states with such a tax, which now yielded $364 million, and in 1952 there were 31 states with a sales tax. The 1952 yield was $2,229 million. But the Federal government has added more items on which it collects a retail sales tax. This was particularly true during the war years. Moreover, some communities, particularly some of the large cities, have turned to the retail sales tax as a source of local tax revenue. The accompanying graph shows the trend in state tax collections from general sales.

GENERAL SALES TAXES COLLECTED BY STATES
(Based on data from Bureau of Census)



The sales tax may be a set amount or it may be a rate in per cent. State sales taxes on gasoline, for example, are usually a few cents a gallon. That is, in a state where the gasoline tax is 5 cents a gallon, the tax on 5 gallons would be 25 cents or on 15 gallons would be _?_.

When the sales tax is in terms of per cent, we proceed as follows to find the tax on any sale. Let's assume the rate is 3% and that you have bought a bicycle for $41.75. The tax will be 3% of 41.75, or .03 × 41.75, which equals _?_.

Questions to Discuss and Problems to Solve

1. How much did state retail sales taxes increase in the period 1942–1952? (See graph, page 369.)

2. In Paul Hendrick's state there is a $2\frac{1}{2}\%$ sales tax. Paul's father estimates that his purchases for the family on which the tax must be paid average $150 monthly. At this rate how much does Mr. Hendrick pay in sales tax in a year?

3. Assume that the following articles are bought in different states. Find the amount of sales tax on each:

ARTICLES	PRICE	TAX RATE	AMOUNT OF TAX
(*a*) Gloves	$3.75	3%	?
(*b*) Shoes	9.80	2%	?
(*c*) Groceries	2.78	$2\frac{1}{2}\%$	?
(*d*) Candy	1.50	$3\frac{1}{2}\%$	?
(*e*) Hatchet	2.83	1%	?
(*f*) Dress	25.49	1%	?
(*g*) Suit	29.95	$1\frac{1}{2}\%$	?
(*h*) Automobile	856.00	3%	?

4. Tom Thomas bought the family groceries on his way home from school. The items were: 4 pounds cabbage at 8 cents a pound; 5 pounds oranges, 49 cents for 5 pounds; 4 pounds roast at 65 cents a pound; 1 loaf of bread, 17 cents; 3 cans of tomatoes, 29 cents for 3 cans; and 1 box of cereal, 19 cents. How much sales tax did Tom pay at the rate of $2\frac{1}{2}\%$?

5. Mrs. Morris bought a dress for $19.95, two pairs of stockings at $1.19 a pair, and a hat for $4.98. How much sales tax did she pay at a rate of $2\frac{1}{2}\%$?

6. Find out the amount of the state tax on alcoholic beverages in your state for the past several years, and the purposes for which the revenue was spent. Picture these facts by a graph.

7. The Federal tax on cigarettes is $4.00 per thousand. How much is this on a package of 20 cigarettes?

8. Cigars that sell for 10 cents each are taxed by the Federal government at the rate of $10 per thousand. This is how much per cigar? What per cent of the selling price of the cigar?

9. In 1938 the Federal tax rate on movie tickets was 1 cent for each 10 cents or fraction thereof. In 1952 the rate was 1 cent for each 5 cents or fraction thereof. If a 1938 ticket cost 45 cents without tax, how much was the total cost? How much was the total cost of the same ticket at 1952 rates?

10. The admission tax to football games was also 1 cent for each 5 cents or fraction thereof in 1952. If a ticket sold for $1.50 without tax, how much had to be added for the tax? If 15,720 such tickets were sold for one game, how much tax was paid on the total sales?

11. Compute the Federal taxes on the following items at the rates indicated:

ITEM	TAX RATE
(*a*) $6 clock	20%
(*b*) 50¢ shaving lotion	20%
(*c*) 75¢ long-distance telephone call	25%
(*d*) 60¢ telegram	25%
(*e*) $3.50 monthly telephone service	15%
(*f*) $5.50 bus fare	15%
(*g*) 6 electric-light bulbs at 5¢	20%
(*h*) 60¢ talcum powder	20%

PROBLEM IV

How Is the Tax on Property Computed?

Jane went with her father and mother to view some property that her parents were thinking of buying. It was located just beyond the city limits. The real estate dealer told them that an advantage in owning the property was the low *assessed value.* He said also that the *tax rate* was only $2.25. Earlier, while looking at property in town, Jane had heard the real estate agent say, "The tax rate is $4.50."

Jane asked her father what the real estate dealer meant by "assessed value" and "tax rate." Mr. Allen gave her this answer:

"An important official of our city is the tax assessor. It is his job to estimate the true value of each piece of property in the city. Then a fractional part — about one half in our city — of this true value is entered in the tax books as the ***assessed value*** of each piece of property. For example, the assessed value of the property we looked at in town this morning is $3000. This means that the tax assessor estimates the true value of the property to be $6000, but for purposes of taxation the value is listed as $3000.

"Now the tax collector uses the ***tax rate*** to decide how much taxes should be collected on the $3000 assessed value. A tax rate of $4.50 means that the taxes on each $100 of assessed value amount to $4.50. The tax rate is sometimes given as the number of mills per dollar. Our rate would then be expressed as 45 mills. Still another way of expressing the tax rate is a per cent of assessed value. If our rate were expressed this way, it would be $4\frac{1}{2}\%$."

"But how is the tax rate determined?" Jane asked next.

"It is found by using two figures, the estimated expenses of the city and the total assessed value of property in the city," Mr. Allen told Jane. "Each year the city council prepares a *budget* in which it estimates the amount of money the city must spend the next year. Last year the expenses were estimated at $576,000. This amount, called the *tax levy,* had to be collected from taxes on the privately owned property, which had an assessed value of $12,800,000. The tax rate was found by dividing the tax levy by the assessed value, or $576{,}000 \div 12{,}800{,}000 = .045$. As I have said, this can be expressed as 45 mills per dollar, $4.50 per $100, or $4\frac{1}{2}\%$."

Jane did a little figuring and then asked Mr. Allen if the tax bill on the $6000 property they had looked at in the city would be $135.

"That is right," Mr. Allen said. "How did you compute that amount?"

"I took $3000, the assessed value, and divided by 100. This gave me 30. Then I multiplied $4.50 by 30 and that gave me $135."

"That's right," Mr. Allen said. "Now, if the rate had been expressed as 45 mills, you would have found the product of 3000 × .045. You would have made the same multiplication if the rate had been expressed as $4\frac{1}{2}$%. The tax bill is $135 in any case."

Why do you think the tax rate was higher on property in town than on property beyond the city limits?

Now let's see if you can compute taxes. See if you can find the amount of taxes paid on property with an assessed value of $3850 if the tax rate is $4.80 per $100.

First method. $3850 ÷ 100 = _?_. $4.80 is the tax on each of these hundreds. Therefore, the total tax is $4.80 × 38.5 = $_?_.

Second method. $4.80 per $100 is the same as _?_ mills per dollar, or _?_ per cent. In either case, this is .048 × 3850 = _?_.

Problems to Solve and Things to Do

1. Find the tax bill on each of the following pieces of property:

	Assessed Value	Tax Rate
(*a*)	$ 7,500	50 mills per $1.00
(*b*)	9,300	$2.60 per $100
(*c*)	3,850	$1\frac{3}{4}$%
(*d*)	5,425	70 mills per $1.00
(*e*)	10,500	47 mills per $1.00
(*f*)	23,700	$.84 per $100
(*g*)	4,500	$3\frac{1}{2}$%
(*h*)	97,300	$2.30 per $100
(*i*)	12,750	$4.30 per $100
(*j*)	6,600	$2\frac{1}{2}$%

2. Find the tax rate in dollars per hundred for the following:

	Assessed Values	Levy		Assessed Values	Levy
(*a*)	$713,000	$28,520	(*e*)	$1,272,000	$44,520
(*b*)	586,000	24,300	(*f*)	3,800,000	123,500
(*c*)	226,500	6,795	(*g*)	7,536,000	320,280
(*d*)	138,800	7,634	(*h*)	28,172,000	1,619,890

3. Mr. Lane is buying a house through the Building and Loan Association. His payments on principal and interest are $38.72 each month. How much must he add to this amount each month to cover taxes if the assessed value is $8000 and the tax rate is 48 mills per dollar?

4. Mr. Henderson owns several apartment houses and buildings in the business district of his town. The total assessed value of his property is $276,500, and the rate is $4.38 per $100. Of this rate, $1.53 goes for schools, $.78 for fire protection, and $.97 for police protection. What is Mr. Henderson's total tax bill, and how much of it is for the support of schools, how much for fire protection, and how much for police protection?

5. In a city where the total assessed valuation of all property is $1,170,000,000, the cost of schools is $27,876,000, the cost of fire protection is $2,756,000, and the cost of police protection is $4,813,000. What would be the separate tax rate for each of these services?

6. What is the tax levy for your town? In case you live in the country, use the nearest incorporated city or the one in which you do your trading. Has there been a change in the tax rate in recent years?

7. Bring to class a tax receipt and a tax notice.

8. Make a clear distinction between real estate and personal property.

9. What is a tax on "intangibles"? Does your state levy such a tax?

10. Bring to class newspaper articles about taxes, especially those that concern the people of your community.

Photo by Pennsylvania Department of Highways

The revenue obtained from the taxes on automobiles and gasoline is used to construct smooth highways over which the automobile may travel.

PROBLEM V

How Does the Automobile Furnish Tax Revenue?

A basic guide in taxation is that money must be collected from where it *is*. This guide tends to lead toward a "soak the rich" program or toward taxes on things which many persons have and use constantly. The millions of automobiles owned and driven by the people in the United States make the automobile and the fuel for moving it excellent sources of tax income.

The tax on an automobile at the time the vehicle is purchased is a sales tax, and the tax on gasoline — the fuel that furnishes the power — is a sales tax. Although we have already studied sales taxes in general, we shall give special attention here to the tax on gasoline as a part of the tax revenue furnished by the automobile.

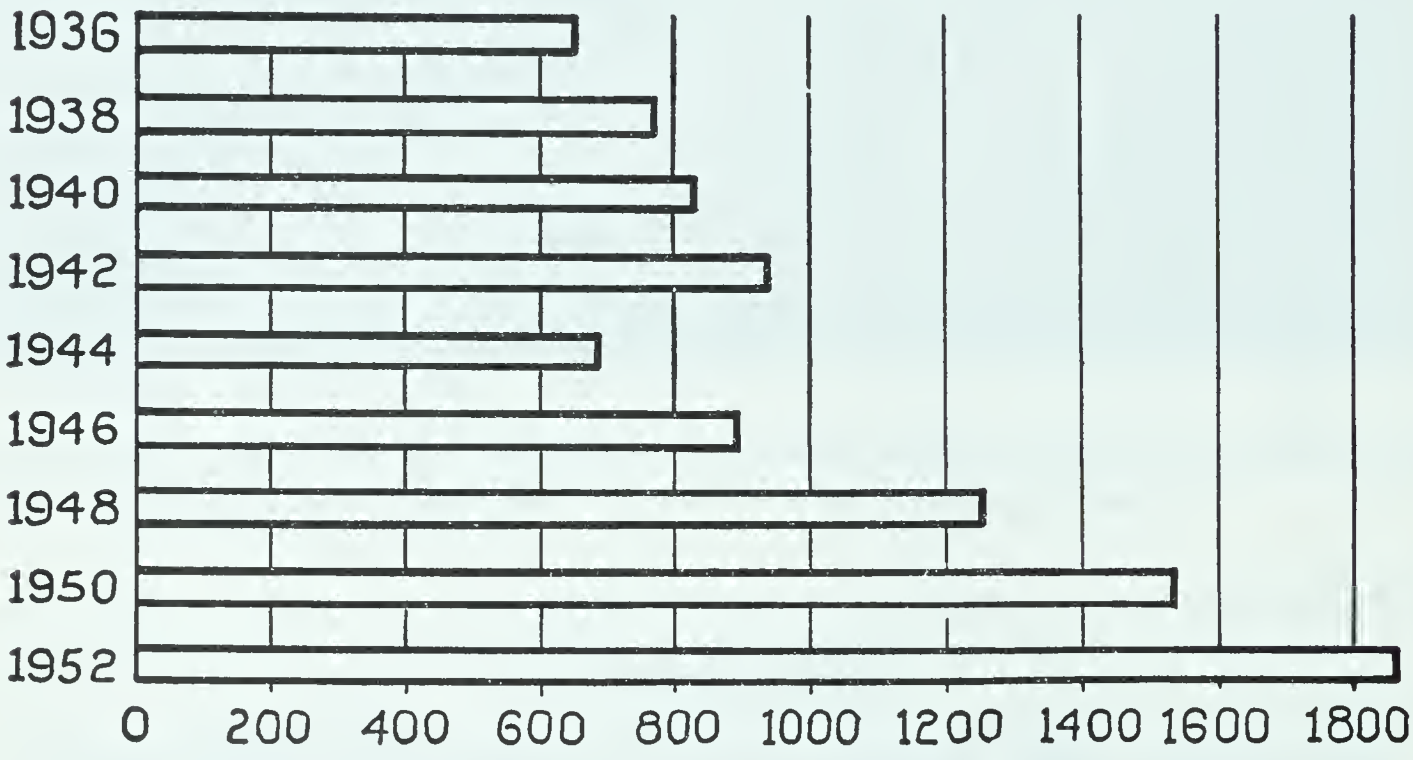
Each state has its own system for determining the tax for owning and operating an automobile (license tax).

Gasoline is a source of taxes.

The state tax rate on gasoline varies much in the several states. In some it as little as 2 cents per gallon, while in others it is as high as 7 cents per gallon. In addition to these state gasoline taxes there is a Federal tax of $1\frac{1}{2}$ cents per gallon in all states.

In this graph you can readily see how rapidly the revenue from gasoline taxes increased in our country between 1936 and 1952. Can you explain the drop in 1944 and the increase in 1946?

Gasoline Taxes Collected by the States
(Source: Bureau of Census)



Scale in millions of dollars

Questions to Discuss and Problems to Solve

1. How many millions of dollars of state revenue did the gasoline tax produce in 1938? in 1942? in 1946? in 1952?

2. How many millions of dollars did revenue from the gasoline tax increase each 2-year period from 1946 to 1952? In which 2-year period was this increase the greatest? In which 2-year period was it the smallest? What was the amount of decrease between 1942 and 1944? the amount of increase between 1944 and 1946?

3. How would you describe the trends in revenues from gasoline taxes as pictured in this graph?

4. The Intercity Bus Company used on the average 6000 gallons of gasoline for each bus it operated last year. How much gasoline tax did the company pay on 6000 gallons of gasoline if the tax rate was 5½ cents per gallon? The state's part of this tax was 4 cents and the Federal government's part was 1½ cents. How much of the gasoline tax for each bus went to the state? to the Federal government? How much did the company pay to the state and how much to the Federal government for the 25 buses that it operated regularly?

5. Mr. Frederick is computing the total taxes he paid on gasoline used last year. He is doing this because the law allows him to deduct this amount from his income in computing state income taxes. Here are Mr. Frederick's facts. See if you can compute the total gasoline taxes he paid.

Number of miles driven, 4000
Average miles per gallon, 16
Number of gallons of gasoline used, _?_
Tax rate, 5¾ cents per gallon
Total taxes paid, _?_

6. While driving westward on his vacation, Mr. Allen traveled across five states. He filled his tank whenever it was convenient, but he found that the tax rates varied considerably from state to state. So on the return trip he decided to buy as much gasoline as possible in the states where the rate was low and as little as possible in the others. This table will show how Mr. Allen saved on the return trip. Compute the actual amount saved.

STATE	TAX RATE PER GALLON	NO. GALLONS BOUGHT GOING	TAXES PAID	NO. GALLONS BOUGHT ON RETURN TRIP	TAXES PAID
A	3	6	—	20	—
B	6½	20	—	6	—
C	4½	12	—	10	—
D	5	11	—	8	—
E	4	10	—	15	—
Totals		—	—	—	—

Photo by Pennsylvania Department of Highways

Do you think gasoline taxes should be used to pay for snow removal?

Special investigations

7. Ask each student whose family has a car to get an estimate of the number of gallons of gasoline used by his family last month or last year. From this information compute the Federal gasoline taxes paid by the families represented in your class, at the rate of $1\frac{1}{2}$ cents per gallon. If there is a state gasoline tax in your state, find out the rate at any filling station and compute the total taxes for the cars represented in your class.

8. Find out the gasoline tax rates charged in each of the 48 states and the District of Columbia. You can get this information at some filling stations and almost certainly at the nearest office of your local automobile association. Prepare an outline map of the United States so as to show these rates by states.

9. Prepare a frequency distribution of the gasoline rates charged by the various states. Draw a graph picturing these frequencies. Find the mean, median, and modal rates. (Refer to Unit I if you need to.)

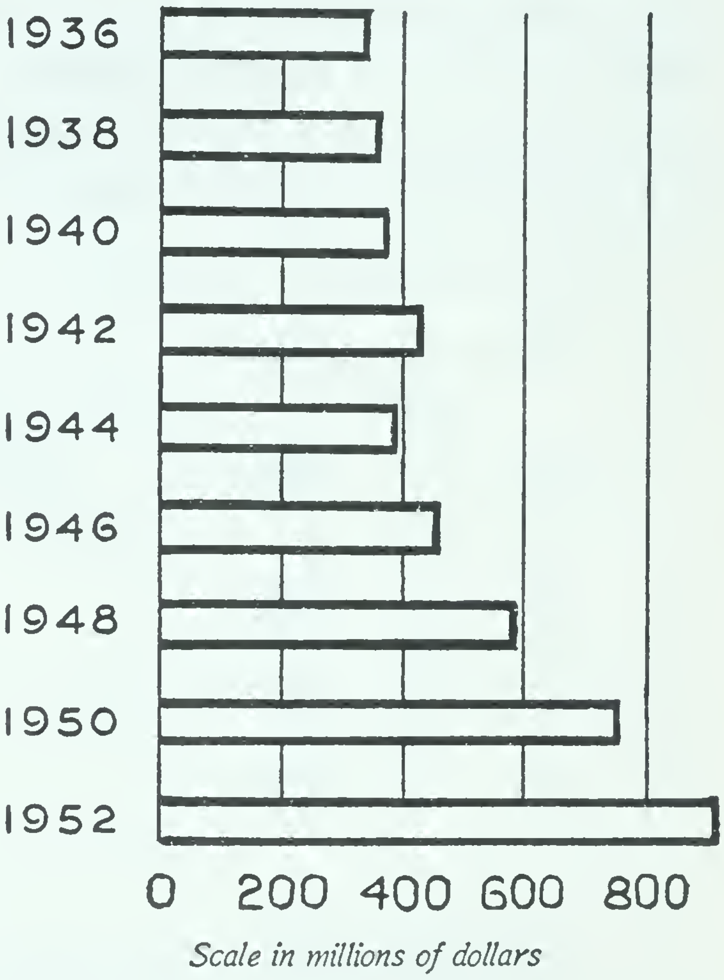
10. Find out how gasoline taxes are spent in your state. If desirable, picture by a graph the facts that you get.

11. In some states the following question is a controversial issue: Shall the money collected by a tax on gasoline be used only for the construction and repair of roads? Which side of this argument do you support? What are your reasons?

The automobile license is a source of taxes.

The graph on this page shows how state tax income from automobile license fees changed between 1936 and 1952. What effect did the freezing of tire and new car sales have on tax income from this source between 1942 and 1944?

Many plans exist among the 48 states for collecting automobile license fees. Though the plan of making the charge on the basis of weight is becoming more general, there are still some states in which the automobile license tax is a flat rate, others in which it is based on horsepower, and still others in which it is based on value. Which do you think is a better rate basis, horsepower or weight? In England cars do not generally have as high horsepower as ours do. Do you think this can be explained by the fact that in England automobile license taxes are based on horsepower?


AUTOMOBILE LICENSE TAXES COLLECTED BY THE STATES

Questions to Discuss and Problems to Solve

1. In which year was the state revenue from motor vehicle licenses smallest? How much was it that year? What was the revenue for the year when the greatest amount was collected in motor vehicle licenses?

2. Read from the graph the total amount paid in license fees for 1946. If there were 32 million motor vehicles registered, what was the average cost of a license?

3. How would you describe the trend in state revenues from motor vehicle licenses as pictured in this graph?

4. Make the necessary readings from the graph on the preceding page and compute how much state revenues from motor vehicle licenses increased in the years from 1936 to 1942. What do you think are some of the reasons which account for this increase? How do you account for the decrease in 1944 and the increase from 1946 to 1952?

5. In the following table compute the license fees charged for each of the weights for each rate. The first charge of $11.20 is computed for you. Since 80 pounds is more than half a hundred pounds, the first weight is counted as 3200 pounds. Multiply 32 by 35 cents, which gives $11.20. When the fractional part of a hundred pounds is 49 or less, as in cars B and C, this fractional part is dropped.

CAR	WEIGHT	RATE PER 100 POUNDS		
		35 CENTS	40 CENTS	25 CENTS
A	3180	$11.20		
B	2640			
C	4430			
D	3770			

6. Some cities collect automobile license taxes in addition to those collected by the state. In the table below are given the weights of several cars and the rates charged by a particular city in a state which charges 38 cents per 100 pounds. Compute the license fees for the state, the city, and the total. The first amount is computed for you.

CAR	WEIGHT	RATE PER 100 POUNDS		
		STATE 38 CENTS	CITY 10 CENTS	TOTAL 48 CENTS
A	2710	$10.26		
B	3360			
C	3150			

7. License fees on trucks are usually more than they are for passenger cars. Moreover, the rates are frequently higher for heavy trucks than for light ones. Here is the scale of rates for trucks in one state:

If truck carries 2500 lb. or less, rate is 65 cents per 100 lb.
If truck carries 2501 lb. to 4000 lb., rate is 80 cents per 100 lb.
If truck carries 4001 lb. to 6000 lb., rate is $1.00 per 100 lb.
If truck carries over 6000 lb., rate is $1.25 per 100 lb.

Using this rate scale, find the license fees on trucks carrying 2300 lb., 2800 lb., 4275 lb., 6520 lb., 2230 lb., and 4715 lb.

8. Some states tax automobiles by the rated horsepower (manufacturer's rating). In this table are given the rates for three different states. Compute the license fees for each car at each rate given.

CAR	HORSEPOWER	RATE PER HORSEPOWER		
		20 CENTS	25 CENTS	28 CENTS
A	60			
B	75			
C	120			

Special investigations

9. Find out the basis used by the 48 states for collecting automobile license fees. Prepare an outline map of the 48 states to show these facts.

10. Find out how the revenue from the automobile license fees is spent in your state. If it is spent for more than one purpose, you may find it worth while to draw a simple bar graph to show how much is spent for each purpose.

11. Obtain from local automobile dealers the information necessary to determine the annual license fees for ten different makes or models of automobiles. Compute the amounts. (NOTE. If the automobile license fee in your state is a flat rate, you need not attempt this investigation.)

Richard B. Hoit from Cushing

PROBLEM VI

What Are Customs Duties?

From the study of American history you may have learned how controversial the question of high tariff versus low tariff has been in our country. The Republican party has stood for high tariffs, which in general have been supported by the manufacturers. The Democratic party has held that the welfare of the country can better be served by low tariffs. With this policy the farmers of the country have generally agreed. Why do you think the manufacturers might favor high tariffs and the farmers prefer low tariffs? Remember that high tariff means high taxes on goods from abroad so that prices on imported goods for United States customers are higher than when low tariff rates prevail.

The tariff issue continues to be a live one. The Democrats have claimed that the Hawley-Smoot Bill (high tariff, Republican) which was in force when the Democrats came into power in 1933 was a fundamental cause of the depression of the 1930's. The Republicans maintain with equal certainty that Cordell Hull's reciprocal trade pacts (low tariff, Democrat) materially operated against the welfare of the country. What arguments do you think might be advanced in support of each of these claims? What is the situation today?

In the table on this page are the *tariff rates* imposed by the Hawley-Smoot (Republican) Tariff Act of 1930 and those imposed by the Underwood (Democrat) Tariff Act of 1913. You will notice that on some items the rates are about the same, while on others there is a great difference.

The rates are expressed in two ways. A rate that expresses the duty in terms of a pound, dozen, bushel, or other unit of measure is called a ***specific duty.*** One that is expressed as a per cent is called an ***ad valorem duty.*** Which of the articles listed in the following table have a specific duty? an ad valorem duty?

Duties on imports are collected by government officials, called *customs officers.* These men examine all goods brought into this country, if necessary call for an appraisal of the value of the goods, and finally report on the amount of tax due. Until 1910 customs duties constituted the principal source of revenue for the Federal government. In recent years, however, the income from this source has declined in relative importance.

TARIFF RATES

ITEMS SUBJECT TO TARIFF	UNDERWOOD ACT 1913	HAWLEY-SMOOT ACT 1930
Poultry	2¢ per lb.	10¢ per lb.
Corn	free	25¢ per bu.
Oatmeal	.3¢ per lb.	.8¢ per lb.
Apples	10¢ per bu.	25¢ per bu.
Peanuts, shelled	¾¢ per lb.	7¢ per lb.
Chocolate and cocoa	25%	40%
Sugar	.71¢ per lb.	1.7125¢ per lb.
Woven wool fabrics	25–40%	40–60%
Blankets	25%	50–60%
Cotton sewing thread	15%	20–35%
Silk cloth	45%	55–65%
Pig iron	free	$1.12½ per ton
Bicycles	25%	30%
Ink	15%	10–15%
Toilet soap	10%	30%
Table salt	free	.07¢ per lb.
China	55%	60–70%
Matches	3¢ per gross	20¢ per gross
Furs	30%	25%
Dominoes	40%	50%

Problems to Solve and Things to Do

1. Find the import duty (amount of tax) collected on the following shipments for each of the rates given in the table. Where more than one rate is given for an article, use the lower one in making computations.

> EXAMPLE. On 1500 bushels of apples the import duty is \$.10 × 1500 = \$150 according to the Underwood Tariff Rate. The duty is \$.25 × 1500 = \$375 according to the Hawley-Smoot Tariff Rate.

(*a*) 7 tons of peanuts
(*b*) 1800 pounds of oatmeal
(*c*) 26 tons of sugar
(*d*) \$3800 worth of chocolate
(*e*) \$1750 worth of blankets
(*f*) \$823 worth of bicycles
(*g*) \$153 worth of ink
(*h*) \$1578 worth of toilet soap
(*i*) \$27,300 worth of china
(*j*) \$4325 worth of cotton thread
(*k*) \$1672 worth of dominoes
(*l*) 1200 gross of matches

2. Mr. Henry Blume is an importer of dry goods and women's wearing apparel. His last order included woven wool fabrics worth \$18,750, silk cloth worth \$5372, furs worth \$23,817, and blankets worth \$2715. What import duty did he pay on the total order according to the Hawley-Smoot rates? (If two rates are given, use higher rate.)

3. How much more did the order cost Mr. Blume under the Hawley-Smoot rates than it would have cost him under the Underwood rates?

4. The purchasing department of a large chain of grocery stores has placed an order with foreign merchants for 2300 pounds of chocolate at 18¢ a pound; 3 tons of oatmeal at 5¢ a pound; 1500 dozen bars of toilet soap at 25¢ a dozen; 7 tons of table salt at \$20 a ton; and 1500 gross of matches at 73¢ a gross. What import duty will have to be paid, following the Hawley-Smoot rates? (If two rates are given, use higher rate.)

5. How much less would the import duty on the purchases in Ex. 4 have been if the Underwood rates had applied?

Special investigation *

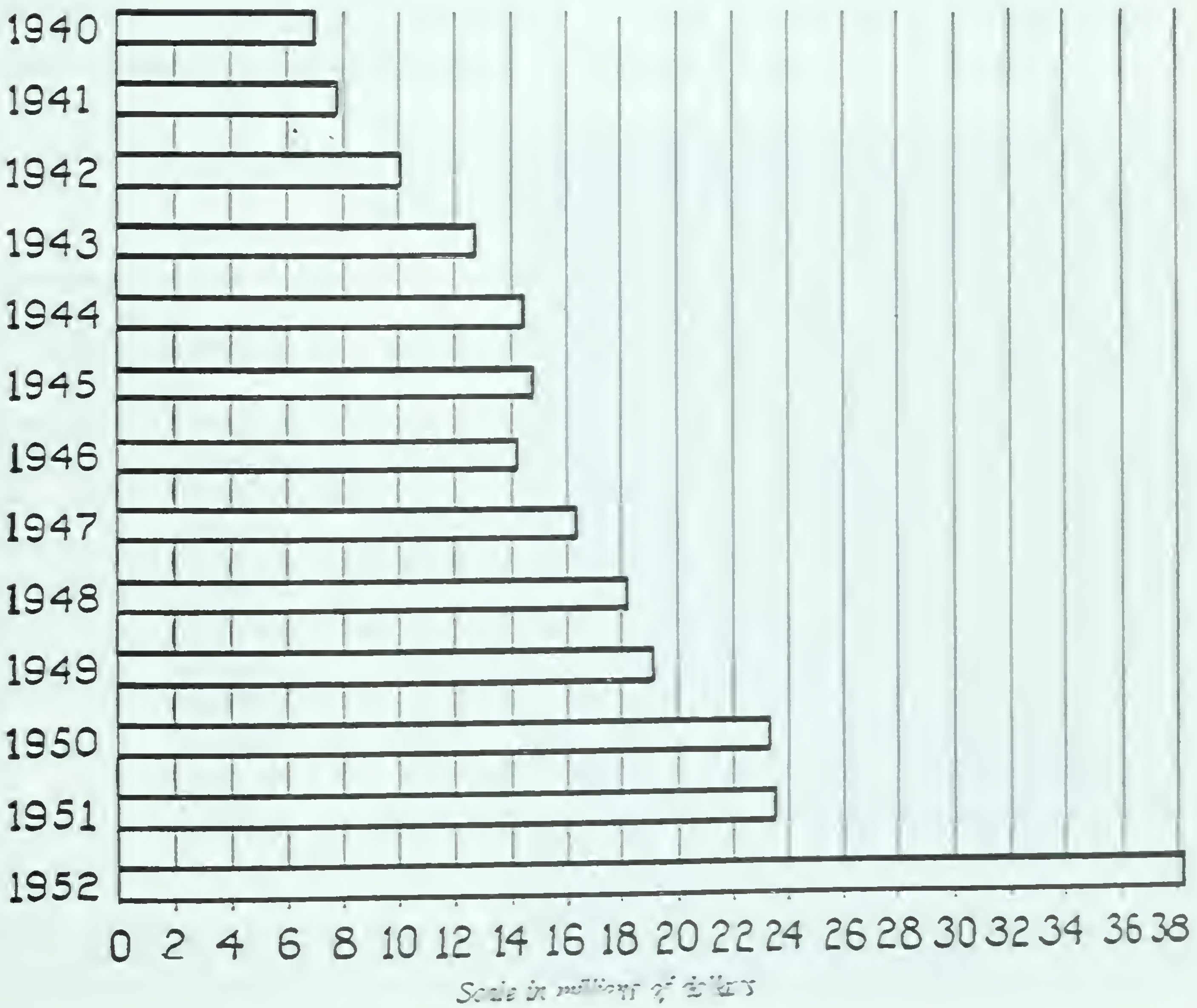
6. Prepare a report on how tariffs may affect some large business in your community. Your report may deal either with some farm product or with a manufactured article.

PROBLEM VII

How Are Social Security Benefits Financed?

You learned in Unit VI that a very extensive system of insurance, covering the hazards of disability, retirement, dependency, and unemployment, was started by our government in 1937. By looking at the graph below you may see how rapid has been the increase in the amount of social security taxes that were collected to pay for this insurance. It will be interesting to watch the development of social security during the next ten years. There are many who feel that its provisions should be extended and many others who feel that we cannot afford the cost. The problems that follow will give you some idea of how much it does cost both employers and employees to provide social security benefits.

SOCIAL SECURITY TAXES
(Source: *Treasury Bulletin*)



Questions to Discuss and Problems to Solve

1. Roy Nelson received the following monthly wages, from which $1\frac{1}{2}\%$ social security tax was deducted: \$154.46, \$187.23, \$212.16, \$190.71, \$165.73, \$183.58, \$187.83, \$180.51, \$171.18, \$169.98, \$170.60, \$190.47. What was the total social security tax paid by Roy? What would be Roy's social security taxes at the higher rate of 2% which was proposed to begin in 1954?

2. Virginia Watson has earned the following amounts as a telephone operator over a period of 5 years: \$2200, \$2320, \$2380, \$2440, and \$2500. How much have she and her employer paid in social security taxes on her wages if the $1\frac{1}{2}\%$ rate existed the first 4 years and the 2% rate the fifth year? (Employer and employee pay at the same rate.)

3. A person is required to pay social security taxes on only \$3600 of his yearly wages. If he pays more, as in the following situation, he may obtain a refund covering the overpayment. Herbert Wilson had three different jobs during a single year. He earned \$2352 in job A, \$1456 in job B, and \$784 in job C. From each of these amounts the $1\frac{1}{2}\%$ social security tax was deducted. How much refund may he get?

4. The Consolidated Manufacturing Company's payroll for a week included the following social security tax entries:

EMPLOYEE	WAGES	EMPLOYEE'S SOCIAL SECURITY	EMPLOYEE	WAGES	EMPLOYEE'S SOCIAL SECURITY
Sarah Harrison	\$33.18		Jane Schmidt	\$42.60	
Mary Eason	36.32		Alex Binetti	51.75	
Betty Wells	41.21		Fred Gitchell	50.00	
Alice Barlow	29.20		Frances Willett	48.70	
Jack Snavely	41.50		Heath Dabney	52.60	
Claude Graham	40.75		Joe Mason	55.00	
Don Jessup	44.56		Frank Dorsey	60.00	
Charles Clinch	47.58		John Thrift	68.00	
Joseph Fekas	49.60		Lewis Craft	51.16	
Florence Duke	34.13		Harold Stahl	53.58	

Assume the $1\frac{1}{2}\%$ rate is used and compute the amount paid by each employee and the total amount by the employer and all the employees.

5. Social security taxes for household employees are collected, starting in January, 1951. To get social security credits, a household worker must work for one employer *on some part of 24 different days in a calendar quarter and must be paid $50 or more in cash.* Wages from more than one employer may be considered, but only for those households in which the combined 24 day–$50 cash wage requirement is met. Compute the social security tax withheld by each employer of the following household employees:

For Calendar Quarter January 1–March 31

Mrs. Olson: 28 days, $84
Mrs. Newton: 14 days, $42
Mrs. Jones: 22 days, $66
Mrs. Wilson: 32 days, $96

6. Social security taxes are paid by self-employed persons. The rate for 1953 is $2\frac{1}{4}\%$, and the proposed rate from 1954 through 1959 is 3%. Mr. Hofstra operates a hardware store which he owns. His annual earnings from the store in 1953 amounted to $6200. What amount did he have to withhold from his own wages and send to the Director of Internal Revenue for social security taxes that year?

Ewing Galloway

FIRE ALARM
F.D.
1114

Public fire alarms are connected directly to all the firehouses in the city. A well-organized, well-equipped fire department paid for out of taxes will greatly reduce the fire hazard in a city and will result in lower premiums for fire insurance.

PROBLEM VIII

What Does a Citizen Buy When He Pays Taxes?

It has already been mentioned that the individual average tax bill in 1951 for persons in the United States was $417. This is more than $1.00 a day. If the total tax were divided equally among the approximately 60,000,000 wage earners in this country, the daily individual tax would be nearly $3.00. Does this seem to you like a lot of money to pay to the government? Can you think of some reasons why many persons do not seriously object to paying out so much money in taxes? The exercises which follow are intended to help you understand how money spent in taxes may be a good investment.

Questions to Discuss and Problems to Solve

1. In Meadowbrook the yearly cost of education is $205 per child. Sixty per cent of this cost, or ?, is borne by the city. The school-tax rate in Meadowbrook is 14.5 mills. At this rate how much property must a person own before the school tax on the property is enough to pay the city's part of the cost of educating one child a single year?

2. Mr. Jacobs has property in Meadowbrook with an assessed value of $8400. His school tax at the rate of 14.5 mills is ?. This is what per cent of the $615 which the education of his three children costs the city annually?

3. Each of Mr. Jacobs' three children went to school in Meadowbrook for 12 years. At $205 per year for each child the total cost to the city of educating Mr. Jacobs' children was ?. He would therefore have to pay the $121.80 in yearly school taxes levied on his property for ? years before he would pay to the city as much in school taxes as the city spent on the education of his children.

4. Why is the city government interested in spending more for the education of the children of its citizens than it collects from the individual parents in school taxes? How can the city government afford to do this?

5. In Middletown the fire department has succeeded so well in controlling fires that the annual loss from fire has been reduced from $3.45 to 12 cents per person. This is a total saving of __?__ for the 17,500 people in the city.

6. The fire department gets 1.6 mills of the property tax in Middletown. Mr. Tilden owns property with an assessed value of $9500. His taxes for the support of the fire department amount to __?__.

7. Because of the present low fire loss in Middletown, the fire insurance rate has been reduced from 22 cents to 12 cents per $100. Mr. Tilden's property has a real or market value of $18,000, and he insures it for 80% of its real value. How much less does his fire insurance cost him now than before the rates were lowered?

8. Mr. Tilden's saving of $14.40 on fire insurance pays __?__% of the $15.20 in taxes that he pays for the support of the fire department.

9. The fire insurance rate on farm property near Middletown is 38 cents per $100. This is __?__ cents per $100 more than Middletown's rate of 12 cents per $100. Mr. Tilden's $18,000 worth of property, insured for 80% its value, would cost __?__ if it were farm property. Because of the low rate in Middletown his insurance actually costs him __?__ less than this amount.

10. Do you agree that fire insurance rates are high in rural sections largely because there are no fire departments? Do you agree that money spent for taxes may be well invested?

Special investigations

11. Find out the fire insurance rates on residences in the country or town nearest your community. Then ask how much of the tax rate goes to support the fire department in the town. From these facts compare the cost of taxes for fire protection with the difference in cost of insurance in town and country.

12. You may wish to find out the school-tax rate in your community and the cost of education per child for the locality. Then decide how much property a person must own before his school taxes pay for the education of one child for one year.

Final Test on Unit VII

PART I

Copy on a piece of paper the numbers 1 through 8. Indicate your answer to each statement by placing the proper letter at the left of the corresponding number. (*Do not write in your book.*)

_?_ **1.** Tax collections from the property tax are —
(*a*) increasing (*b*) decreasing (*c*) remaining about the same

_?_ **2.** Income taxes are collected by the —
(*a*) Federal government (*b*) Federal government and several states (*c*) states and localities

_?_ **3.** Gasoline taxes are collected by the —
(*a*) localities and states (*b*) states and Federal government (*c*) states only

_?_ **4.** Customs duties are collected by the —
(*a*) states only (*b*) Federal government only
(*c*) states and Federal government

_?_ **5.** An illustration of a progressive tax rate is the —
(*a*) income tax (*b*) property tax (*c*) sales tax

_?_ **6.** The largest percentage of the total taxes paid in this country is now collected by the —
(*a*) localities (*b*) states (*c*) Federal government

_?_ **7.** An example of a fixed rate tax is the —
(*a*) tobacco tax (*b*) gifts tax
(*c*) income tax

_?_ **8.** The source of greatest tax income for the states is now the —
(*a*) gasoline tax (*b*) income tax (*c*) property tax

PART II: PROBLEMS

9. If the property tax rate is \$2.75 per \$100, what is the tax bill on property with an assessed value of \$16,400?

10. If \$57,040 in taxes are to be levied on \$1,426,000 worth of property, the tax rate must be _?_ mills per \$1.00.

11. Mr. Bowman must pay income tax on a balance of \$1253 after the deductions and exemptions have been made. How much is his total net tax according to the 1952 rates?

12. Miss Hayes has just returned from an automobile trip. She used the following amounts of gasoline at the prices indicated. How much did her gasoline cost? How much of it went for taxes?

15 gallons at 27.3¢ including 4¢ tax
13 gallons at 28.5¢ including 5¢ tax
10 gallons at 26.7¢ including 6¢ tax
17 gallons at 28.1¢ including 3¢ tax
9 gallons at 24.3¢ including 2¢ tax

13. In a state where the sales tax is 3%, compute the tax on each of the following purchases:

3 pairs hose	at \$1.69
1 pair shoes	at 9.50
1 hat	at 12.50
1 dress	at 24.49

14. John Roeder worked for 3 months for the Model Advertising Agency at a monthly wage of \$350; for 7 months for the Wolfe Public Relations Counsel at a monthly wage of \$375; and for King & Company for 2 months at a monthly wage of \$380. From each monthly payroll $1\frac{1}{2}\%$ social security tax was deducted. How much refund may he get?

15. The fire department in Madisonville gets 1.3 mills of the property tax. How much does Mr. Clinchy pay toward the support of the fire department if his property is assessed at \$18,500?

PART III

The Middletown Fire Department needs a new firehouse and much new equipment. The city has outgrown the present fire department, and recently the residential sections have had poor fire protection. The city council is proposing to borrow the $150,000 needed for the fire department. This is to be paid back over 20 years from city taxes. A vote is to be taken to see whether or not the council will be given the authority to borrow the money. If you were a voting citizen of Middletown, which of the following courses of action would you take?

(*a*) Vote for the loan
(*b*) Vote against the loan
(*c*) Seek more information before deciding to vote

16. Select from the following lists the reasons which you think support your decision. (*Do not write in your book.*)

_?_ *A.* Extra fire protection is likely to result in enough savings from reduced fire insurance rates to pay the extra taxes that will be required to pay off the loan.

_?_ *B.* It would be nice to have the new equipment, but taxes are already so high the people simply can't afford to pay any more.

_?_ *C.* As a matter of civic pride the citizens of Middletown should want as good fire equipment as any other town.

_?_ *D.* If the town is already heavily in debt, $150,000 more indebtedness should not be added, regardless of the benefits.

_?_ *E.* People considering moving to Middletown to live will do so more readily if there is good fire protection.

_?_ *F.* A person should know what new taxes will be levied in Middletown to pay off the debt.

_?_ *G.* If the council does not propose new taxes to meet the debt, the voters should know what other public services will be reduced.

Charles Phelps Cushing

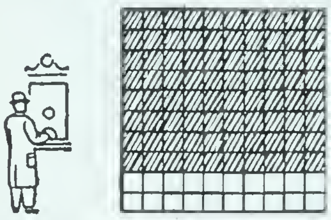
COMPUTATION WORKSHOP

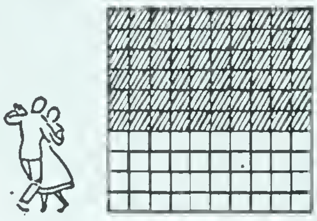
Weeding Out Weaknesses

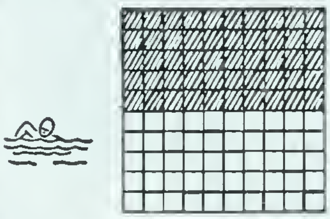
Part I: How to Use Per Cents

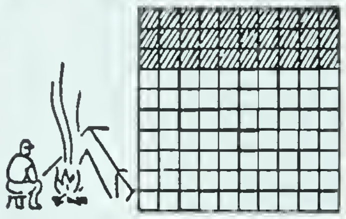
Basic Idea in Per Cents

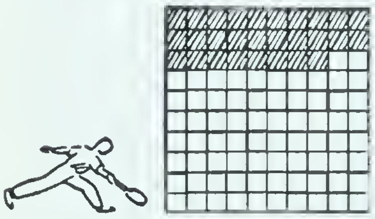
The first idea about per cents which you should fix in your mind is that a certain per cent means just so many out of a hundred. Each of the graphs, or *grids,* shown below contains 100 small squares. These graphs were made by an assembly committee to show what per cent of the students (how many out of every 100 students) in their school took part in each of eight different recreations.

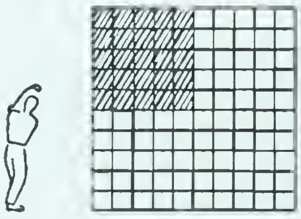

80% attend movies regularly

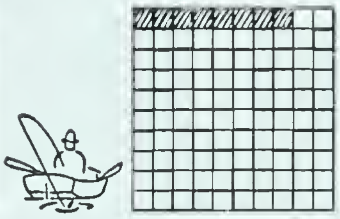

60% enjoy ballroom dancing

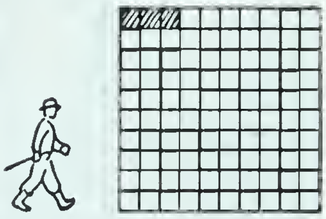

50% can swim 60 yards


30% enjoy overnight camping


28% like to play tennis


25 % like to play golf


8% enjoy fishing


3% enjoy hiking

To show that 80% of the students attend movies regularly, the committee shaded 80 small squares; and to show that 60% enjoy ballroom dancing, they shaded 60 small squares. Similarly, in each grid they shaded as many small squares as the number of per cents that they wished to show.

One small square is what part of each grid? Write $\frac{1}{100}$ as a decimal fraction. Another common way of writing $\frac{1}{100}$ is 1 *per cent,* and a shorter way is 1%. The symbol % is used universally to stand for "per cent." Complete each of the following:

$\frac{80}{100}$ = .80 = 80 per cent = 80 %
$\frac{60}{100}$ = _?_ = _?_ per cent = _?_ %
$\frac{50}{100}$ = _?_ = _?_ per cent = _?_ %
$\frac{30}{100}$ = _?_ = _?_ per cent = _?_ %
$\frac{28}{100}$ = _?_ = _?_ per cent = _?_ %
$\frac{25}{100}$ = _?_ = _?_ per cent = _?_ %
$\frac{8}{100}$ = _?_ = _?_ per cent = _?_ %
$\frac{3}{100}$ = _?_ = _?_ per cent = _?_ %

Fractions and Decimals to Per Cents

See how these fractions become decimals:

$$\tfrac{2}{5} = 5\overline{)2} = .40 \qquad\qquad \tfrac{2}{3} = 3\overline{)2} = .66\tfrac{2}{3}$$

Any fraction may be written as a decimal simply by dividing the numerator of the fraction by the denominator.

Notice how these decimals are changed to per cents.

$$.40 = 40\% \qquad .66\tfrac{2}{3} = 66\tfrac{2}{3}\% \qquad .07 = 7\%$$

To change any decimal to a per cent, move the decimal point two places to the right and place the per cent symbol after the number. (Add zeros if necessary.)

1. Complete these statements:

SAMPLE. $\frac{3}{8} = .37\frac{1}{2} = \dfrac{37\frac{1}{2}}{100} = 37\frac{1}{2}\%$

$\frac{1}{8} = \underline{\ ?\ } = \underline{\ ?\ } = \underline{\ ?\ }\%$ $\qquad \frac{3}{4} = \underline{\ ?\ } = \underline{\ ?\ } = \underline{\ ?\ }\%$

$\frac{3}{5} = \underline{\ ?\ } = \underline{\ ?\ } = \underline{\ ?\ }\%$ $\qquad \frac{3}{10} = \underline{\ ?\ } = \underline{\ ?\ } = \underline{\ ?\ }\%$

2. Write these fractions as decimals and then as per cents:

(*a*) $\frac{1}{2}$
(*b*) $\frac{1}{20}$
(*c*) $\frac{1}{200}$
(*d*) $\frac{1}{2000}$
(*e*) $\frac{3}{8}$
(*f*) $\frac{51}{200}$
(*g*) $\frac{3}{400}$
(*h*) $\frac{1}{16}$
(*i*) $\frac{113}{400}$
(*j*) $\frac{41}{500}$
(*k*) $\frac{9}{200}$
(*l*) $\frac{73}{200}$
(*m*) $\frac{2}{25}$
(*n*) $\frac{21}{1000}$
(*o*) $\frac{1}{500}$
(*p*) $\frac{43}{1000}$
(*q*) $\frac{243}{1000}$
(*r*) $\frac{5}{8}$
(*s*) $\frac{3}{16}$
(*t*) $\frac{4}{25}$
(*u*) $\frac{9}{300}$
(*v*) $\frac{81}{600}$
(*w*) $\frac{84}{2000}$
(*x*) $\frac{600}{2400}$

Per Cents to Fractions and Decimals

It is easy to change a per cent to a common fraction if you remember that *per cent* means hundredths. For example:

$$15\% = \tfrac{15}{100} = \tfrac{3}{20} \quad \text{and} \quad 7\% = \tfrac{7}{100}$$

To change a per cent to a common fraction, write the number without the symbol, over 100. Then reduce the fraction to its lowest terms.

And it is just as easy to change a per cent to a decimal fraction. Using the values given on the preceding page:

$$15\% = \frac{15}{100} = .15 \qquad 7\% = \frac{7}{100} = .07$$

To change a per cent to a decimal, omit the symbol and move the decimal point two places to the left. (Add zero if needed.)

1. Change to common fractions in lowest terms:

(*a*) 60%
(*b*) 30%
(*c*) 75%
(*d*) 40%
(*e*) 50%
(*f*) 18%
(*g*) 25%
(*h*) 90%
(*i*) 20%
(*j*) 80%
(*k*) $16\frac{2}{3}\%$
(*l*) $37\frac{1}{2}\%$
(*m*) $62\frac{1}{2}\%$
(*n*) $33\frac{1}{3}\%$
(*o*) $66\frac{2}{3}\%$

2. Change to decimals:

(*a*) 20%
(*b*) 30%
(*c*) 35%
(*d*) 45%
(*e*) 80%
(*f*) 25%
(*g*) 75%
(*h*) 15%
(*i*) 12%
(*j*) 1%
(*k*) 20.5%
(*l*) 38.7%
(*m*) 72.6%
(*n*) $5\frac{1}{2}\%$
(*o*) $3\frac{1}{4}\%$

Finding a Per Cent of a Number

Dick Brown's father owns a grocery store. When Dick's mathematics class had a picnic supper in the county park, they bought $12 worth of food at the Brown grocery. Since his son was in the group, Mr. Brown gave the class a *discount* of 15%.

Do you know how to find 15% of $12? Remember that $15\% = \frac{15}{100} = .15$. So 15% of $12 = .15 × $12 = $1.80.

Assume that the class on a second picnic buys $15 worth of food and is given a discount of 18%. How much would the discount be? How would you find it?

Finding a certain per cent of a number is the most common of all problems with per cents. Remember:

> (*a*) *Per cent* means hundredths; for example, 12 *per cent* means .12
> (*b*) *Per cent of* means hundredths times; for example, 12 *per cent of* means .12 ×

and you will be able to use and understand the following rule:

To find a per cent of a number, write the per cent as a decimal and multiply the number by the decimal.

1. Find these per cents:

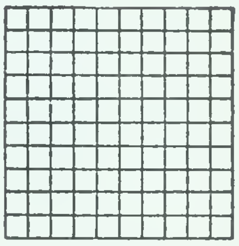
(*a*) 16% of 80
(*b*) 32% of 50
(*c*) 15% of 64
(*d*) 27% of 60
(*e*) 7% of 8
(*f*) 18% of 25
(*g*) 50% of 48
(*h*) 5% of 18
(*i*) 22% of 65
(*j*) 60% of 42
(*k*) 16% of 24
(*l*) 60% of 100
(*m*) 2% of 72
(*n*) 1% of 45
(*o*) 45% of 24
(*p*) 63% of 18
(*q*) 82% of 210
(*r*) 71% of 430
(*s*) 6% of 250
(*t*) 16% of 240
(*u*) 18% of 72
(*v*) 42% of 18
(*w*) 64% of 84
(*x*) 40% of 458

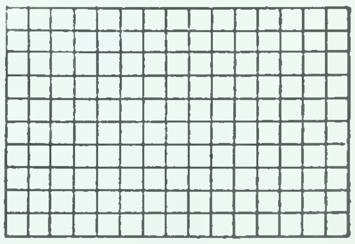
2. Here are some more difficult per cents:

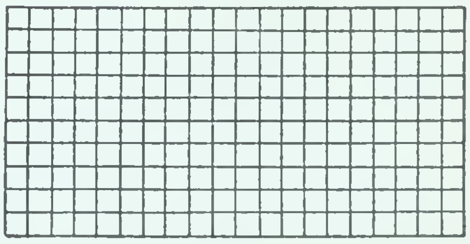
(*a*) 5.6% of 180
(*b*) 3.2% of 340
(*c*) 12.5% of 160
(*d*) 15.2% of 294
(*e*) 3.6% of 1572
(*f*) 1.5% of 3000
(*g*) $10\frac{1}{2}$% of 80
(*h*) $25\frac{1}{2}$% of 200
(*i*) $30\frac{1}{4}$% of 60
(*j*) $56\frac{1}{3}$% of 90
(*k*) $72\frac{1}{2}$% of 453
(*l*) $83\frac{1}{3}$% of 781

Finding Per Cents Greater than 100%

We come now to a trouble spot. This need not be hard for you, provided you study these figures.


A


B


C

(1) How many small squares are there in A? How many small squares are there in B?
Complete: A = ___?___ units
B = ___?___ units
Since B is $1\frac{1}{2}$ times as large as A, B is ___?___% of A.
And 100% of a number = $\frac{100}{100}$ of a number = 1 times the number = all of it.
Then 150% of a number = $\frac{150}{100}$ of that number or ___?___ times that number.

(2) Now let us compare C and A. A = ___?___ units; C = ___?___ units; C is ___?___ times as large as A; C is ___?___% of A. 200% of a number = $\frac{200}{100}$ of that number = ___?___ times the number.

1. See if you can do these:

(*a*) 300% of a number = ___?___ times that number.
(*b*) 125% of a number = ___?___ times that number.
(*c*) 175% of a number = ___?___ times that number.
(*d*) 325% of a number = ___?___ times that number.
(*e*) 350% of a number = ___?___ times that number.
(*f*) 275% of a number = ___?___ times that number.
(*g*) 450% of a number = ___?___ times that number.

Study these three samples:

(1) $\frac{3}{2}$ times a number = $1\frac{1}{2}$ times that number = 1.50 times that number = 150% of that number.
(2) $\frac{5}{4}$ times a number = $1\frac{1}{4}$ times that number = 1.25 times that number = 125% of that number.
(3) $\frac{7}{4}$ times a number = $1\frac{3}{4}$ times that number = 1.75 times that number = 175% of that number.

2. Write each of these values as per cent:

(*a*) $\frac{5}{4}$ times a number
(*b*) $\frac{6}{5}$ times a number
(*c*) $\frac{7}{4}$ times a number
(*d*) 3.25 times a number
(*e*) 2.50 times a number
(*f*) 1.75 times a number
(*g*) $1\frac{4}{5}$ times a number
(*h*) 4.50 times a number
(*i*) $3\frac{1}{4}$ times a number
(*j*) .62 times a number
(*k*) 0.45 times a number
(*l*) 3.50 times a number

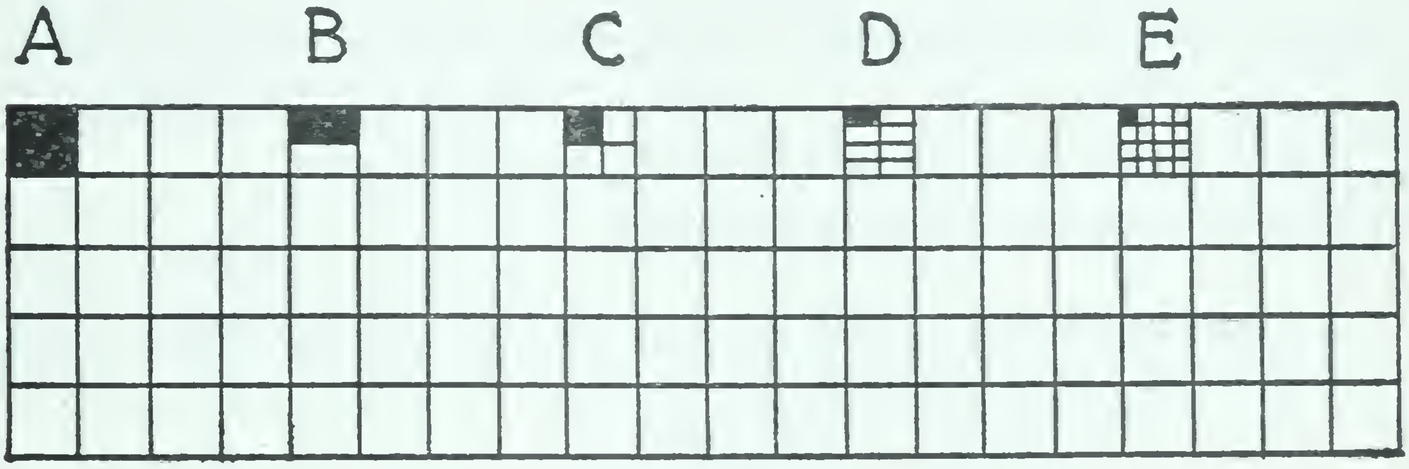
Finding a Per Cent Smaller than 1%

In newspapers you will often find business dealings reported in which such per cents as $\frac{1}{2}$%, $\frac{1}{4}$%, and $\frac{1}{8}$% occur. Finding $\frac{1}{2}$% of 860 looks like an easy problem. However, even a good computer may make a careless mistake in solving such a problem.

Do you see what the difficulty is? In this problem we need to find a *part of 1%*. It is usually best to find first *one* whole per cent of a number and then take the part called for. Thus, to find $\frac{1}{2}$% of 860 we take two steps:

First step. 1% of \$860 = \$8.60
Second step. $\frac{1}{2}$ of \$8.60 = \$4.30

In this figure notice the black square marked A. It is 1% of the whole figure. Why? What per cent of the whole figure is the black part marked B? What rule does this suggest for finding $\frac{1}{2}\%$ of a number?



What per cent of the whole figure is the black square marked C? What rule does this suggest for finding $\frac{1}{4}\%$ of a number? What per cent of the whole figure is the black part marked D? What rule does this suggest? What per cent of the whole figure is the black part marked E? State the rule for finding $\frac{1}{16}\%$ of a number.

Instead of saying "one-half per cent" ($\frac{1}{2}\%$), we may say "one half of one per cent" ($\frac{1}{2}$ of 1%). $\frac{1}{2}\%$ is the same as $\frac{1}{2}$ of 1%. Also .4% is sometimes written .4 of 1%.

Try these:

1. $\frac{1}{4}\%$ of \$760
2. $\frac{1}{5}\%$ of 420
3. $\frac{1}{5}\%$ of 42,500
4. $\frac{3}{4}\%$ of 1200
5. $\frac{2}{5}\%$ of \$1500
6. $\frac{1}{8}\%$ of \$320
7. $\frac{3}{8}\%$ of \$3280
8. $\frac{3}{5}\%$ of \$165
9. 1% of 464
10. $\frac{1}{3}\%$ of 675
11. $\frac{1}{4}\%$ of 460
12. $\frac{2}{5}\%$ of 650
13. $\frac{7}{8}\%$ of \$1600
14. $\frac{7}{8}\%$ of \$160
15. $\frac{7}{8}\%$ of \$16

16. .1% of \$3500

SUGGESTION. Follow the general rule — first find 1% of the number and then find .1 of the result. Thus

First step. 1% of \$3500 = \$35
Second step. .1 of \$35 = \$3.50

17. .1% of \$4240
18. .2% of \$750
19. .5% of 800
20. .6% of 320

Finding What Per Cent One Number Is of Another

A sample problem looks like this: 3 is what per cent of 25?

Note that you are to *compare* 3 and 25. And 3 is $\frac{3}{25}$ of 25. However, you are "not quite home," for you are asked to express this relation or ratio as hundredths. Since 3 is $\frac{3}{25}$ of 25, you need only to change $\frac{3}{25}$ to hundredths. As you know, you do this by dividing the numerator 3 by the denominator 25 and get .12 or 12%.

Now try two more sample problems.

(1) Donald missed 14 words on a spelling test of 40 words. What per cent of the words did he miss?

First step. 14 is $\frac{14}{40}$ of 40

Second step. $14 \div 40 = .35 = 35\%$

Therefore, 14 is 35% of 40.

(2) Helen missed 15 words on this same spelling test. What per cent does she need to study?

First step. 15 is $\frac{15}{40}$ of 40

Second step. $15 \div 40 = .37\frac{1}{2} = 37\frac{1}{2}\%$

Therefore she needs to study $37\frac{1}{2}\%$.

The general rule is:

To find what per cent one number is of another, (*a*) find what fractional part the one is of the other, (*b*) change this fraction to a decimal, and (*c*) express the decimal as a per cent.

Now let us see how this rule is used.

1. 6 is what per cent of 80?

(*a*) 6 is what part of 80?

(*b*) Change $\frac{6}{80}$ to a decimal.

(*c*) Change the decimal to a per cent.

(*a*) 6 is $\frac{6}{80}$ of 80.

(*b*)
$$\begin{array}{r} 0.075 \\ 80\overline{)6.00} \\ 5\,60 \\ \hline 400 \\ 400 \\ \hline \end{array}$$

(*c*) The answer is $7\frac{1}{2}\%$.

2. 7 is what per cent of 56? of 40? of 80?

3. 9 is what per cent of 50? of 200? of 400?

4. $4\frac{1}{2}$ is what per cent of 5? of 50? of 25?

5. 97 is what per cent of 200? of 400? of 600?

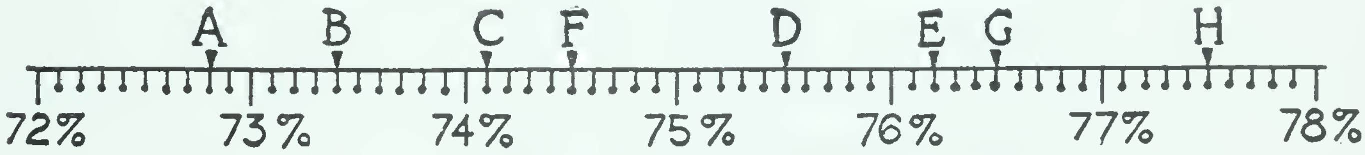
6. In a class of 30 students, 24 are boys. What per cent are boys?

7. In a class of 40 students, 18 are girls. What per cent are girls?

8. If you have read 90 pages of a book of 400 pages, what per cent of the book have you read?

Use Sensible Answers When Dealing with Per Cents

As you have seen, an answer may have three or more decimal places. For most purposes the *nearest* whole per cent is accurate enough. But you want to be sure that you understand what is meant by "the *nearest* whole per cent." Suppose that in a problem your answer is 72.8% and you wish to report your answer to the nearest whole per cent. Look at A = 72.8%. Is it not clear that, if you wish to claim accuracy to the nearest whole per cent, 73% is a better answer than 72%?



1. How would you record to the nearest whole per cent the answer corresponding to B? to C? to E?

2. Let us agree to record 72.5% as 73% and 73.5% as 74%. Then how would you record D? F? G? H?

3. Express each of the following to the nearest whole per cent:

(*a*) 32.4% (*c*) 65.1% (*e*) 7.6% (*g*) 44.87% (*i*) 98.55%
(*b*) 26.8% (*d*) 38.3% (*f*) 6.5% (*h*) 13.23% (*j*) 36.45%

4. 32.87% expressed *to the nearest tenth*[1] of a per cent is 32.9%; 32.85% expressed *to the nearest tenth* of a per cent is 32.9%. What is 32.81% expressed *to the nearest tenth* of a per cent?

5. Express each of the following to the nearest tenth of a per cent:

(*a*) 26.73% (*c*) 17.73% (*e*) 15.11% (*g*) 92.923% (*i*) 15.251%
(*b*) 28.66% (*d*) 16.25% (*f*) 16.07% (*h*) 75.589% (*j*) 72.067%

---

[1] "To the nearest tenth" means also "correct to tenths."

6. The students in Mr. Dale's class had this problem to solve: If 5 out of 30 students are absent, what per cent of the pupils are absent?

Jane's solution. $\frac{5}{30} = \frac{1}{6} = \begin{array}{r} .16\frac{2}{3} \\ 6\overline{)1.00} \end{array} = 16\frac{2}{3}\%$

Fred's solution. $\frac{5}{30} = \frac{1}{6} = \begin{array}{r} .166+ \\ 6\overline{)1.000} \end{array} = 16.6\% = 17\%$ (nearest whole per cent)

Harry's solution. $\frac{5}{30} = \frac{1}{6} = \begin{array}{r} .1666+ \\ 6\overline{)1.0000} \end{array} = 16.66\% = 16.7\ \%$(nearest tenth of a per cent)

Should Mr. Dale have marked them all correct?

Per Cent of Increase or Decrease

Last week Ann had a score of 50 in spelling. This week she received a score of 65 in spelling. Can you find Ann's per cent of improvement?

Improvement $= 65 - 50 = 15$ points
15 points $= \frac{15}{50}$ of 50 points
$\frac{15}{50} = \frac{3}{10} = 30\%$
Ann's improvement was 30%.

Last month there were 18 cases of tardiness, but this month there were only 8 cases. What is the per cent of decrease in tardiness to the nearest tenth of a per cent?

Decrease $= 18 - 8 = 10$
$\frac{10}{18} = .555 = 56\%$ (nearest whole per cent)

The rule is:

To find the per cent of increase or decrease, find what per cent of the original number the amount of increase or decrease is.

Find the nearest whole per cent of increase or decrease:

1. Frank once earned $30 a week. Now he earns $45 a week.

2. In 1900 the population of Smithville was 1240. Now it is 900.

3. Enrollment at Hope High last year was 1200. Now it is 1350.

4. George weighed 96 pounds when he entered high school. At graduation he weighed 132 pounds.

Part II: Competence in Computation

How to Attain Accuracy

This section of the book will help you to conquer your own difficulties in computation. Here you will find the Practice Tests keyed to the Inventory Tests in the various units. Proper use of the Practice Tests will enable you to overcome your individual weaknesses and attain competence.

In your notebook you should keep a Record Form similar to the one shown below.

RECORD OF PROGRESS

Name.......................... *School*..........................

TEST	GOAL REACHED	NUMBER OF TRIALS TAKEN	DATE OF LAST TRIAL	TEST	GOAL REACHED	NUMBER OF TRIALS TAKEN	DATE OF LAST TRIAL
1*				8*			
1 A				8 A			
1 B				8 B			
1 C				8 C			
1 D				8 D			
2*				9*			
2 A				9 A			
2 B				9 B			
3*				9 C			
3 A				9 D			
3 B				9 E			
4*				9 F			
4 A				9 G			
4 B				10*			
5*				10 A			
5 B				10 B			
5 C				10 C			

*Starred tests are Inventory Tests. If you pass an Inventory Test, you may put a check (√) for each test you skip in the space marked "Goal Reached."

Addition Practice

This is the kind of practice you need if you did not pass Inventory Test 1. Allow 4 minutes for *each* Practice Test. Do each test as many times as you need in order to reach a satisfactory goal. Your grade is the number of examples right. Answers are on page 425.

Practice Test 1 A: Adding by Endings

57 + 8 =	48 + 6 =	87 + 7 =	96 + 7 =	36 + 8 =
73 + 9 =	73 + 9 =	54 + 9 =	53 + 9 =	47 + 7 =
26 + 7 =	74 + 8 =	84 + 9 =	28 + 7 =	28 + 8 =
36 + 5 =	92 + 9 =	44 + 7 =	35 + 7 =	58 + 8 =
54 + 8 =	56 + 7 =	93 + 8 =	26 + 9 =	24 + 9 =
84 + 8 =	85 + 8 =	69 + 4 =	53 + 9 =	53 + 8 =
27 + 8 =	78 + 5 =	26 + 7 =	24 + 8 =	77 + 6 =
84 + 9 =	23 + 9 =	55 + 8 =	64 + 6 =	47 + 6 =
34 + 9 =	47 + 7 =	85 + 8 =	21 + 9 =	

Goals: *Excellent, 43. Good, 40. Passing, 37.*

Practice Test 1 B: Single-Column Addition

5	9	7	5	6	9	6	2	7	6
3	7	3	9	3	2	6	8	6	9
9	5	6	2	2	5	5	7	2	8
8	6	4	8	7	4	7	9	7	3
6	3	8	6	5	2	3	3	5	6
4	1	5	1	4	7	1	0	4	2
2	5	7	6	9	9	6	8	9	8

5	8	5	7	1	3	4	2	8	9
9	3	6	7	7	8	8	7	8	2
8	2	3	3	5	4	8	9	3	5
2	6	4	4	9	9	1	8	4	3
5	4	2	8	2	7	9	4	6	7
4	4	9	6	6	2	5	5	7	4
6	9	8	2	3	6	3	6	8	2

Goals: *Excellent, 20. Good, 19. Passing, 16.*

Practice Test 1 C: Triple-Column Addition

278	268	111	553	626	370	227
603	354	253	486	514	459	383
456	107	784	351	328	282	225
287	362	252	202	652	506	450
188	458	627	595	781	683	267
383	288	775	233	966	108	629
876	167	324	153	234	855	208

GOALS: *Excellent, 7.* *Good, 6.* *Passing, 5.*

Practice Test 1 D: Broken-Column Addition

733		58	6834	8
8		7373	59	4537
46733	8	296	678	499
23	4832	60	8	5
962	67	28378	4779	73

		56	4	6639
7	327	624	362	458
285	4868	92	5727	70
4639	35	7899	45	655

GOALS: *Excellent, 9.* *Good, 8.* *Passing, 7.*

Multiplication Practice

If you did not pass Inventory Test 2, practice on one or both of these tests as often as you need in order to reach your goal. Allow 4 minutes for each Practice Test. See page 425 for answers.

Practice Test 2 A: Multiplication — Two Places

770	504	260	930	704
32	28	54	58	46
506	240	408	930	806
38	96	94	47	97
660	607	460	803	240
43	26	23	41	70

GOALS: *Excellent, 14.* *Good, 13.* *Passing, 11.*

Practice Test 2 B: Multiplication — Large Numbers

2000 200	612 300	703 20	660 1000	410 20	9359 47
4367 93	4730 56	2345 53	5602 37	9623 25	36 287

GOALS: *Excellent, 12.* *Good, 11.* *Passing, 9.*

Subtraction Practice

If you did not pass Inventory Test 3, practice on one or both of these tests as often as you need in order to reach your goal. Allow 4 minutes for each Practice Test. See pages 425–426 for answers.

Practice Test 3 A: Subtraction with "Borrowing"

96 78	63 37	56 49	28 16	43 28	84 76	267 88
626 89	372 48	650 17	826 78	872 87	737 99	540 77
656 97	861 63	136 54	949 76	770 723	478 340	749 607
834 264	818 479	611 473	760 254	100 73	500 26	600 406
	400 7	900 284	100 58	1000 602		

GOALS: *Excellent, 31.* *Good, 27.* *Passing, 21.*

Practice Test 3 B: Subtraction — Large Numbers

47346 28137	15946 7870	807342 92761	235604 98675
684770 92437	487638 62546	818207 37584	26767 12854

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33133 25687	87676 28819	763841 86547	283547 50928
478172 453286	978396 48709	67283 29884	287342 92738

GOALS: *Excellent, 15.* *Good, 13.* *Passing, 11.*

Division Practice

If you did not pass Inventory Test 4, practice on one or both of these tests as often as you need in order to reach your goal. Allow 4 minutes for each Practice Test. Answers on page 426.

Practice Test 4 A: Long Division

This exercise is hard. But you needn't worry about division if you can do these examples.

$76\overline{)7372}$	$36\overline{)3024}$	$43\overline{)3182}$	$89\overline{)5607}$
$71\overline{)1988}$	$66\overline{)2574}$	$85\overline{)4960}$	$37\overline{)703}$
$49\overline{)4214}$	$18\overline{)252}$	$96\overline{)3264}$	$43\overline{)3827}$

GOALS: *Excellent, 11.* *Good, 10.* *Passing, 8.*

Practice Test 4 B. Harder Long Division

$9\overline{)333}$	$5\overline{)0}$	$6\overline{)834}$	$7\overline{)709}$
$92\overline{)2484}$	$47\overline{)1090}$	$28\overline{)478}$	$33\overline{)1653}$
$16\overline{)1304}$	$92\overline{)653}$	$51\overline{)1836}$	$68\overline{)4896}$
$54\overline{)1680}$	$33\overline{)1089}$	$54\overline{)1952}$	$88\overline{)2024}$

GOALS: *Excellent, 14.* *Good, 12.* *Passing, 10.*

Fraction Practice

If you did not pass Inventory Test 5, 6, 7, or 8, practice on the corresponding tests on fractions as often as you need to reach your goal. Allow 4 minutes for each Practice Test. Answers on pages 426–427.

Practice Test 5 A: Changing Fractions

Change these to whole or mixed numbers:

$\frac{3}{3}$ $\frac{18}{6}$ $\frac{21}{2}$ $\frac{5}{5}$ $\frac{8}{4}$ $\frac{11}{5}$ $\frac{10}{2}$ $\frac{12}{3}$ $\frac{16}{8}$

$\frac{30}{7}$ $\frac{8}{6}$ $\frac{19}{5}$ $\frac{16}{3}$ $\frac{18}{2}$ $\frac{16}{10}$ $\frac{9}{9}$ $\frac{32}{5}$ $\frac{8}{7}$

$\frac{67}{4}$ $\frac{61}{3}$ $\frac{28}{4}$ $\frac{37}{3}$ $\frac{30}{3}$ $\frac{42}{7}$ $\frac{56}{6}$ $\frac{59}{8}$ $\frac{50}{4}$

$\frac{47}{5}$ $\frac{75}{3}$ $\frac{92}{4}$ $\frac{94}{3}$ $\frac{29}{9}$ $\frac{86}{3}$ $\frac{14}{2}$ $\frac{37}{8}$ $\frac{17}{5}$

$\frac{11}{6}$ $\frac{14}{8}$ $\frac{9}{6}$ $\frac{11}{3}$ $\frac{49}{8}$ $\frac{52}{6}$ $\frac{42}{3}$ $\frac{21}{9}$ $\frac{46}{5}$

$\frac{32}{7}$ $\frac{18}{12}$ $\frac{47}{7}$ $\frac{36}{8}$ $\frac{42}{7}$ $\frac{42}{10}$ $\frac{63}{5}$ $\frac{22}{5}$ $\frac{33}{8}$

$\frac{21}{3}$ $\frac{47}{9}$ $\frac{52}{8}$ $\frac{23}{7}$ $\frac{41}{7}$ $\frac{28}{14}$ $\frac{7}{5}$ $\frac{38}{9}$ $\frac{53}{6}$

GOALS: *Excellent, 62.* *Good, 58.* *Passing, 50.*

Practice Test 5 B: Changing to Improper Fractions

Accuracy is the important thing here.

$7\frac{1}{4} = \frac{}{4}$ $13\frac{2}{3} = \frac{}{3}$ $4\frac{1}{4} = \frac{}{4}$ $5 = \frac{}{7}$ $3\frac{2}{3} = \frac{}{3}$

$2\frac{5}{8} = \frac{}{8}$ $11\frac{2}{7} = \frac{}{7}$ $3 = \frac{}{3}$ $5\frac{1}{8} = \frac{}{8}$ $4\frac{4}{5} = \frac{}{5}$

$10\frac{5}{8} = \frac{}{8}$ $9\frac{4}{5} = \frac{}{5}$ $87\frac{1}{2} = \frac{}{2}$ $3\frac{7}{8} = \frac{}{8}$ $1\frac{9}{11} = \frac{}{11}$

$6 = \frac{}{3}$ $6\frac{1}{4} = \frac{}{4}$ $9\frac{5}{7} = \frac{}{7}$ $6\frac{7}{9} = \frac{}{9}$ $2 = \frac{}{12}$

$2\frac{1}{5} = \frac{}{5}$ $8\frac{1}{3} = \frac{}{3}$ $9\frac{1}{2} = \frac{}{2}$ $4\frac{5}{6} = \frac{}{6}$ $5\frac{2}{3} = \frac{}{3}$

$3\frac{3}{4} = \frac{}{4}$ $7\frac{1}{9} = \frac{}{9}$ $6\frac{2}{3} = \frac{}{3}$ $12\frac{1}{2} = \frac{}{2}$ $3\frac{1}{2} = \frac{}{2}$

$7\frac{1}{2} = \frac{}{2}$ $5\frac{3}{4} = \frac{}{4}$ $1\frac{5}{6} = \frac{}{6}$ $4\frac{7}{9} = \frac{}{9}$ $6\frac{1}{6} = \frac{}{6}$

GOALS: *Excellent, 34.* *Good, 29.* *Passing, 25.*

Practice Test 5 C: Changing to Equal Fractions

Supply the missing numerators:

$\frac{4}{9} = \frac{}{18}$ $\frac{3}{10} = \frac{}{30}$ $\frac{7}{10} = \frac{}{70}$ $\frac{1}{9} = \frac{}{45}$ $\frac{7}{8} = \frac{}{48}$

$\frac{2}{5} = \frac{}{10}$ $\frac{1}{3} = \frac{}{9}$ $\frac{4}{5} = \frac{}{70}$ $\frac{4}{7} = \frac{}{28}$ $\frac{3}{10} = \frac{}{90}$

$\frac{5}{8} = \frac{}{24}$ $\frac{1}{2} = \frac{}{12}$ $\frac{3}{7} = \frac{}{70}$ $\frac{5}{9} = \frac{}{45}$ $\frac{5}{6} = \frac{}{72}$

$\frac{1}{9} = \frac{}{27}$ $\frac{4}{5} = \frac{}{25}$ $\frac{3}{8} = \frac{}{32}$ $\frac{11}{12} = \frac{}{24}$ $\frac{9}{10} = \frac{}{20}$

$\frac{3}{4} = \frac{}{8}$ $\frac{5}{8} = \frac{}{32}$ $\frac{1}{16} = \frac{}{32}$ $\frac{2}{3} = \frac{}{51}$ $\frac{1}{2} = \frac{}{100}$

$\frac{3}{4} = \frac{}{12}$ $\frac{1}{7} = \frac{}{42}$ $\frac{3}{8} = \frac{}{24}$ $\frac{1}{8} = \frac{}{56}$ $\frac{7}{12} = \frac{}{60}$

$\frac{3}{4} = \frac{}{20}$ $\frac{5}{6} = \frac{}{12}$ $\frac{5}{11} = \frac{}{44}$ $\frac{7}{8} = \frac{}{48}$ $\frac{9}{10} = \frac{}{20}$

$\frac{1}{2} = \frac{}{8}$ $\frac{4}{5} = \frac{}{15}$ $\frac{6}{7} = \frac{}{14}$ $\frac{3}{5} = \frac{}{35}$ $\frac{5}{6} = \frac{}{60}$

$\frac{1}{3} = \frac{}{18}$ $\frac{7}{10} = \frac{}{30}$ $\frac{7}{12} = \frac{}{48}$ $\frac{4}{7} = \frac{}{28}$ $\frac{3}{4} = \frac{}{60}$

$\frac{4}{5} = \frac{}{10}$ $\frac{3}{8} = \frac{}{48}$ $\frac{5}{8} = \frac{}{72}$ $\frac{2}{9} = \frac{}{81}$ $\frac{2}{5} = \frac{}{60}$

$\frac{5}{8} = \frac{}{16}$ $\frac{5}{9} = \frac{}{18}$ $\frac{9}{10} = \frac{}{30}$ $\frac{3}{16} = \frac{}{48}$ $\frac{11}{12} = \frac{}{24}$

$\frac{1}{4} = \frac{}{12}$ $\frac{3}{11} = \frac{}{22}$ $\frac{6}{13} = \frac{}{39}$ $\frac{5}{9} = \frac{}{54}$ $\frac{5}{7} = \frac{}{56}$

GOALS: *Excellent, 59.* *Good, 54.* *Passing, 47.*

Practice Test 5 D: Choosing the Least Common Denominator

In adding

Halves and *thirds,* I think of them as ____*ths.*
Halves and *fifths,* I think of them as ____*ths.*
Thirds and *fifths,* I think of them as ____*ths.*
Fifths and *fourths,* I think of them as ____*ths.*
Thirds and *fifteenths,* I think of them as ____*ths.*
Halves and *fourths,* I think of them as ____*ths.*
Halves and *sixths,* I think of them as ____*ths.*
Thirds and *sixths,* I think of them as ____*ths.*
Sixths and *eighths,* I think of them as ____*ths.*
Fifths and *twentieths,* I think of them as ____*ths.*

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Eighths and *sevenths,* I think of them as ____*ths.*
Sixths and *twelfths,* I think of them as ____*ths.*
Eighths and *fifths,* I think of them as ____*ths.*
Fourths and *eighths,* I think of them as ____*ths.*
Halves and *eighths,* I think of them as ____*ths.*
Halves, fifths, and *sixths,* I think of them as ____*ths.*
Halves, fourths, and *halves,* I think of them as ____*ths.*
Thirds, fourths, and *fifths,* I think of them as ____*ths.*
Ninths, tenths, and *halves,* I think of them as ____*ths.*
Halves, halves, and *thirds,* I think of them as ____*ths.*
Thirds, sixths, and *eighths,* I think of them as ____*ths.*
Fourths, ninths, and *twelfths,* I think of them as ____*ths.*
Halves, fourths, and *tenths,* I think of them as ____*ths.*
Thirds, eighths, and *twelfths,* I think of them as ____*ths.*
Thirds, fourths, and *sevenths,* I think of them as ____*ths.*
Thirds, fifths, and *ninths,* I think of them as ____*ths.*
Fourths, sixths, and *eighths,* I think of them as ____*ths.*
Thirds, fourths, and *eighths,* I think of them as ____*ths.*
Fourths, ninths, and *twelfths,* I think of them as ____*ths.*
Fourths, sevenths, and *fourteenths,* I think of them as ____*ths.*
Fourths, fifths, and *sixths,* I think of them as ____*ths.*
Fourths, sevenths, and *eighths,* I think of them as ____*ths.*
Thirds, fifths, and *ninths,* I think of them as ____*ths.*

GOALS: *Excellent, 32.* *Good, 31.* *Passing, 27.*

Practice Test 6 A: Adding Two Fractions — Vertical

$\frac{2}{7}$	$\frac{3}{8}$	$\frac{2}{3}$	$\frac{1}{5}$	$\frac{2}{7}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{1}{10}$
$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{1}{16}$	$\frac{1}{6}$
$\frac{5}{8}$	$\frac{2}{3}$	$\frac{1}{12}$	$\frac{2}{9}$	$\frac{5}{6}$	$\frac{3}{4}$	$\frac{7}{20}$	$\frac{5}{8}$
$\frac{1}{4}$	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{1}{4}$	$\frac{5}{9}$	$\frac{7}{10}$	$\frac{3}{4}$	$\frac{5}{6}$

GOALS: *Excellent, 15.* *Good, 13.* *Passing, 11.*

Practice Test 6 B: Adding Two Fractions — Horizontal

$\frac{4}{5}+\frac{1}{3}=$	$\frac{3}{8}+\frac{3}{4}=$	$\frac{7}{10}+\frac{5}{6}=$	$\frac{2}{10}+\frac{3}{7}=$
$\frac{1}{3}+\frac{1}{4}=$	$\frac{2}{9}+\frac{3}{4}=$	$\frac{9}{11}+\frac{3}{4}=$	$\frac{9}{11}+\frac{1}{3}=$
$\frac{5}{8}+\frac{2}{3}=$	$\frac{4}{5}+\frac{3}{4}=$	$\frac{2}{3}+\frac{5}{8}=$	$\frac{2}{9}+\frac{3}{4}=$
$\frac{7}{10}+\frac{3}{4}=$	$\frac{2}{3}+\frac{5}{12}=$	$\frac{4}{5}+\frac{1}{7}=$	$\frac{4}{5}+\frac{1}{2}=$

GOALS: *Excellent, 15.* *Good, 13.* *Passing, 12.*

Practice Test 6 C: Adding Three Fractions — Horizontal

$\frac{1}{2}+\frac{5}{8}+\frac{3}{4}=$	$\frac{2}{7}+\frac{2}{3}+\frac{4}{21}=$	$\frac{5}{24}+\frac{5}{6}+\frac{3}{4}=$	$\frac{4}{5}+\frac{2}{3}+\frac{1}{2}=$
$\frac{1}{5}+\frac{1}{8}+\frac{1}{4}=$	$\frac{3}{16}+\frac{1}{3}+\frac{1}{2}=$	$\frac{2}{7}+\frac{1}{3}+\frac{10}{21}=$	$\frac{1}{2}+\frac{4}{5}+\frac{2}{3}=$
$\frac{3}{8}+\frac{2}{3}+\frac{3}{4}=$	$\frac{1}{2}+\frac{4}{5}+\frac{3}{4}=$	$\frac{4}{5}+\frac{2}{3}+\frac{5}{6}=$	$\frac{5}{9}+\frac{1}{6}+\frac{2}{3}=$

GOALS: *Excellent, 11.* *Good, 9.* *Passing, 7.*

Practice Test 6 D: Adding Two Mixed Numbers

$\begin{array}{r}4\frac{4}{5}\\ \underline{6\frac{1}{3}}\end{array}$	$\begin{array}{r}7\frac{1}{2}\\ \underline{2\frac{2}{5}}\end{array}$	$\begin{array}{r}3\frac{7}{16}\\ \underline{2\frac{3}{8}}\end{array}$	$\begin{array}{r}7\frac{2}{3}\\ \underline{3\frac{4}{15}}\end{array}$	$\begin{array}{r}4\frac{5}{8}\\ \underline{1\frac{5}{6}}\end{array}$	$\begin{array}{r}7\frac{2}{3}\\ \underline{3\frac{2}{5}}\end{array}$
$\begin{array}{r}3\frac{9}{10}\\ \underline{8\frac{3}{4}}\end{array}$	$\begin{array}{r}2\frac{5}{8}\\ \underline{9\frac{1}{4}}\end{array}$	$\begin{array}{r}6\frac{2}{3}\\ \underline{7\frac{1}{4}}\end{array}$	$\begin{array}{r}4\frac{1}{2}\\ \underline{1\frac{3}{4}}\end{array}$	$\begin{array}{r}6\frac{3}{4}\\ \underline{5\frac{1}{4}}\end{array}$	$\begin{array}{r}9\frac{1}{8}\\ \underline{3\frac{7}{12}}\end{array}$

GOALS: *Excellent, 11.* *Good, 9.* *Passing, 7.*

Practice Test 7 A: Subtraction of Fractions — Vertical

$\begin{array}{c}\frac{4}{7}\\ \underline{\frac{1}{2}}\end{array}$	$\begin{array}{c}\frac{5}{9}\\ \underline{\frac{2}{5}}\end{array}$	$\begin{array}{c}\frac{9}{16}\\ \underline{\frac{1}{4}}\end{array}$	$\begin{array}{c}\frac{1}{2}\\ \underline{\frac{1}{9}}\end{array}$	$\begin{array}{c}\frac{3}{4}\\ \underline{\frac{1}{6}}\end{array}$	$\begin{array}{c}\frac{5}{6}\\ \underline{\frac{3}{4}}\end{array}$	$\begin{array}{c}\frac{4}{5}\\ \underline{\frac{2}{3}}\end{array}$	$\begin{array}{c}\frac{11}{12}\\ \underline{\frac{3}{8}}\end{array}$	$\begin{array}{c}\frac{7}{21}\\ \underline{\frac{1}{3}}\end{array}$	$\begin{array}{c}\frac{9}{15}\\ \underline{\frac{1}{2}}\end{array}$
$\begin{array}{c}\frac{1}{5}\\ \underline{\frac{1}{9}}\end{array}$	$\begin{array}{c}\frac{3}{10}\\ \underline{\frac{1}{20}}\end{array}$	$\begin{array}{c}\frac{5}{8}\\ \underline{\frac{3}{5}}\end{array}$	$\begin{array}{c}\frac{7}{9}\\ \underline{\frac{1}{6}}\end{array}$	$\begin{array}{c}\frac{4}{5}\\ \underline{\frac{1}{3}}\end{array}$	$\begin{array}{c}\frac{2}{3}\\ \underline{\frac{2}{5}}\end{array}$	$\begin{array}{c}\frac{5}{6}\\ \underline{\frac{3}{4}}\end{array}$	$\begin{array}{c}\frac{11}{16}\\ \underline{\frac{3}{8}}\end{array}$	$\begin{array}{c}\frac{4}{5}\\ \underline{\frac{1}{2}}\end{array}$	$\begin{array}{c}\frac{7}{8}\\ \underline{\frac{2}{3}}\end{array}$

GOALS: *Excellent, 19.* *Good, 17.* *Passing, 16.*

Practice Test 7 B: Subtraction of Fractions — Horizontal

$\frac{9}{10} - \frac{3}{5} =$	$\frac{1}{2} - \frac{1}{7} =$	$\frac{9}{10} - \frac{2}{3} =$	$\frac{7}{9} - \frac{1}{6} =$
$\frac{3}{5} - \frac{1}{3} =$	$\frac{11}{12} - \frac{3}{4} =$	$\frac{8}{9} - \frac{3}{7} =$	$\frac{2}{3} - \frac{1}{5} =$
$\frac{14}{36} - \frac{2}{9} =$	$\frac{8}{9} - \frac{1}{2} =$	$\frac{1}{6} - \frac{1}{8} =$	$\frac{5}{8} - \frac{1}{4} =$
$\frac{7}{15} - \frac{1}{3} =$	$\frac{1}{2} - \frac{1}{3} =$	$\frac{11}{12} - \frac{5}{6} =$	$\frac{6}{7} - \frac{2}{3} =$
$\frac{3}{4} - \frac{3}{4} =$	$\frac{9}{10} - \frac{3}{10} =$	$\frac{5}{6} - \frac{3}{8} =$	$\frac{7}{16} - \frac{1}{4} =$
$\frac{2}{3} - \frac{1}{4} =$	$\frac{5}{8} - \frac{3}{16} =$	$\frac{7}{8} - \frac{7}{12} =$	$\frac{7}{10} - \frac{2}{5} =$

GOALS: *Excellent, 23. Good, 20. Passing, 18.*

Practice Test 7 C: Subtraction of Mixed Numbers

$\begin{array}{r} 4\frac{1}{5} \\ \underline{3\frac{3}{8}} \end{array}$	$\begin{array}{r} 6\frac{2}{3} \\ \underline{4\frac{1}{4}} \end{array}$	$\begin{array}{r} 5\frac{1}{8} \\ \underline{2\frac{7}{8}} \end{array}$	$\begin{array}{r} 4\frac{4}{9} \\ \underline{1\frac{1}{3}} \end{array}$	$\begin{array}{r} 8\frac{7}{8} \\ \underline{2\frac{2}{3}} \end{array}$	$\begin{array}{r} 7\frac{5}{12} \\ \underline{5\frac{3}{4}} \end{array}$
$\begin{array}{r} 6\frac{3}{7} \\ \underline{1\frac{2}{3}} \end{array}$	$\begin{array}{r} 4\frac{7}{8} \\ \underline{3\frac{2}{5}} \end{array}$	$\begin{array}{r} 9\frac{5}{12} \\ \underline{6\frac{1}{4}} \end{array}$	$\begin{array}{r} 9\frac{1}{2} \\ \underline{2\frac{1}{3}} \end{array}$	$\begin{array}{r} 5\frac{3}{8} \\ \underline{2\frac{1}{4}} \end{array}$	$\begin{array}{r} 2\frac{4}{5} \\ \underline{1\frac{1}{2}} \end{array}$

GOALS: *Excellent, 11. Good, 9. Passing, 7.*

Practice Test 8 A: Multiplication of Fractions

$\frac{4}{5} \times \frac{7}{8} =$	$\frac{4}{5} \times \frac{3}{4} =$	$\frac{5}{6} \times \frac{4}{5} =$	$\frac{1}{8} \times \frac{1}{2} =$
$\frac{1}{3} \times \frac{6}{7} =$	$\frac{6}{11} \times \frac{2}{3} =$	$\frac{3}{7} \times \frac{2}{3} =$	$18 \times \frac{3}{4} =$
$\frac{7}{8} \times \frac{8}{9} =$	$\frac{1}{8} \times \frac{3}{4} =$	$\frac{3}{4} \times \frac{5}{8} =$	$\frac{5}{8} \times \frac{4}{9} =$
$\frac{3}{5} \times \frac{1}{6} =$	$\frac{3}{4} \times \frac{8}{9} =$	$\frac{7}{8} \times \frac{1}{7} =$	$\frac{2}{5} \times 10 =$
$\frac{5}{8} \times \frac{4}{5} =$	$42 \times \frac{6}{7} =$	$\frac{8}{9} \times 30 =$	$\frac{1}{6} \times 7 =$

GOALS: *Excellent, 19. Good, 17. Passing, 15.*

Practice Test 8 B: Multiplication of Mixed Numbers

$\frac{2}{3} \times 5\frac{1}{3} =$ $\quad$ $1\frac{1}{8} \times 4\frac{1}{5} =$ $\quad$ $3\frac{1}{3} \times \frac{3}{8} =$

$9\frac{1}{2} \times 7\frac{1}{3} =$ $\quad$ $2\frac{7}{9} \times \frac{3}{5} =$ $\quad$ $2\frac{1}{2} \times \frac{4}{9} =$

$7\frac{1}{2} \times 2\frac{1}{2} =$ $\quad$ $\frac{4}{5} \times 6\frac{1}{2} =$ $\quad$ $2\frac{1}{4} \times \frac{2}{3} =$

$9\frac{1}{2} \times 3\frac{1}{3} =$ $\quad$ $5\frac{1}{3} \times 2\frac{1}{4} =$ $\quad$ $3\frac{1}{2} \times \frac{1}{2} =$

GOALS: *Excellent, 11.* *Good, 10.* *Passing, 9.*

Practice Test 8 C: Division of Fractions

Be sure that you do these in the simplest way.

$\frac{1}{3} \div \frac{1}{6} =$ $\quad$ $\frac{7}{10} \div \frac{1}{4} =$ $\quad$ $9 \div \frac{2}{3} =$ $\quad$ $\frac{5}{6} \div \frac{5}{8} =$ $\quad$ $7 \div \frac{3}{4} =$

$\frac{4}{5} \div \frac{5}{6} =$ $\quad$ $\frac{5}{6} \div \frac{3}{8} =$ $\quad$ $\frac{4}{9} \div \frac{1}{3} =$ $\quad$ $\frac{1}{4} \div \frac{1}{8} =$ $\quad$ $\frac{5}{7} \div \frac{1}{5} =$

$\frac{5}{6} \div \frac{4}{5} =$ $\quad$ $\frac{7}{12} \div \frac{3}{4} =$ $\quad$ $\frac{1}{4} \div \frac{1}{5} =$ $\quad$ $\frac{1}{3} \div \frac{5}{9} =$ $\quad$ $\frac{1}{2} \div \frac{1}{2} =$

$\frac{5}{8} \div \frac{1}{4} =$ $\quad$ $\frac{2}{3} \div 12 =$ $\quad$ $6 \div \frac{1}{9} =$ $\quad$ $\frac{1}{3} \div 6 =$ $\quad$ $\frac{1}{8} \div 4 =$

$\frac{6}{7} \div \frac{1}{3} =$ $\quad$ $\frac{1}{5} \div \frac{1}{10} =$ $\quad$ $\frac{9}{16} \div \frac{1}{3} =$ $\quad$ $\frac{2}{5} \div \frac{3}{10} =$ $\quad$ $\frac{3}{5} \div \frac{3}{4} =$

GOALS: *Excellent, 24.* *Good, 21.* *Passing, 18.*

Practice Test 8 D: Division with Mixed Numbers

$6\frac{1}{5} = \frac{\quad}{5}$ $\quad$ $2\frac{3}{10} = \frac{\quad}{10}$ $\quad$ $9\frac{5}{8} = \frac{\quad}{8}$

$2\frac{7}{8} \div \frac{7}{8} =$ $\quad$ $7\frac{1}{2} \div \frac{3}{7} =$ $\quad$ $8\frac{3}{4} \div \frac{5}{8} =$

$5\frac{1}{3} \div \frac{3}{4} =$ $\quad$ $11\frac{1}{4} \div 5 =$ $\quad$ $6\frac{1}{8} \div \frac{2}{7} =$

$6\frac{1}{5} \div \frac{5}{6} =$ $\quad$ $3\frac{1}{2} \div \frac{1}{2} =$ $\quad$ $7\frac{1}{3} \div \frac{1}{2} =$

GOALS: *Excellent, 11.* *Good, 9.* *Passing, 7.*

Decimal Practice

If you did not pass Inventory Test 9 or 10, practice on the corresponding tests on decimals as often as you need to reach your goal. Allow 4 minutes for each Practice Test. Answers on pages 428–431.

Practice Test 9 A: Equivalent Fractions

Supply the missing numbers in the following. You first write each fraction as a common fraction whose denominator is 10, 100, or 1000. Be sure that you understand this sample: $\frac{4}{5} = \frac{80}{100} = .80$

$\frac{?}{2} = \frac{5}{10} = .5$

$\frac{1}{4} = \frac{?}{100} = .25$

$\frac{7}{8} = \frac{875}{1000} = ?$

$\frac{?}{5} = \frac{8}{10} = .8$

$\frac{3}{4} = \frac{75}{100} = ?$

$\frac{1}{5} = \frac{2}{10} = ?$

$\frac{?}{5} = \frac{6}{10} = .6$

$\frac{7}{8} = \frac{?}{1000} = .875$

$\frac{?}{8} = \frac{625}{1000} = .625$

$\frac{1}{2} = \frac{?}{10} = .5$

$\frac{3}{8} = \frac{?}{1000} = .375$

$\frac{?}{4} = \frac{75}{100} = .75$

$\frac{1}{4} = \frac{25}{100} = ?$

$\frac{5}{8} = \frac{625}{?} = .625$

$\frac{3}{4} = \frac{75}{?} = .75$

$\frac{4}{5} = \frac{?}{10} = .8$

$\frac{?}{4} = \frac{25}{100} = .25$

$\frac{1}{5} = \frac{?}{10} = .2$

$\frac{3}{4} = \frac{?}{100} = .75$

$\frac{?}{5} = \frac{6}{10} = .6$

GOALS: *Excellent, 19.* *Good, 17.* *Passing, 15.*

Practice Test 9 B: The Meaning of a Decimal

Arrange the three numbers in each group in descending order.

.6, .06, .30

.81, .18, .9

.6, .567, .67

.36, .575, .70

.87, .875, .700

.375, .08, .26

.63, .3, .143

.45, .9, .234

.35, .80, .3

.70, .425, .2

.783, .077, .81

.09, .431, .6

GOALS: *Excellent, 11.* *Good, 10.* *Passing, 9.*

Practice Test 9 C: Changing Fractions to Decimals

Change each of these fractions to a decimal. Drop all remainders after the third decimal place.

SAMPLE. $\frac{5}{7} = ? \rightarrow 7\overset{.714}{\overline{)5.000}}$

$\frac{3}{14}$	$\frac{5}{9}$	$\frac{1}{9}$	$\frac{4}{9}$	$\frac{1}{8}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{7}{12}$	$\frac{10}{12}$
$\frac{7}{22}$	$\frac{7}{8}$	$\frac{3}{16}$	$\frac{9}{14}$	$\frac{7}{24}$	$\frac{3}{11}$	$\frac{7}{9}$	$\frac{3}{8}$	$\frac{8}{15}$

GOALS: *Excellent, 17.* *Good, 15.* *Passing, 13.*

Practice Test 9 D: Fractional Parts of $1

$.50 = ___ of $1

$.12$\frac{1}{2}$ = ___ of $1

$.06$\frac{1}{4}$ = ___ of $1

$.20 = ___ of $1

$.33$\frac{1}{3}$ = ___ of $1

$.37$\frac{1}{2}$ = ___ of $1

$.60 = ___ of $1

$.35 = ___ of $1

$.80 = ___ of $1

.7 of $1 = ___

$\frac{3}{8}$ of $1 = ___

$\frac{5}{4}$ of $1 = ___

$\frac{1}{12}$ of $1 = ___

$\frac{1}{4}$ of $1 = ___

$\frac{5}{6}$ of $1 = ___

$\frac{3}{4}$ of $1 = ___

$\frac{1}{6}$ of $1 = ___

$\frac{5}{8}$ of $1 = ___

GOALS: *Excellent, 17.* *Good, 15.* *Passing, 13.*

Practice Test 9 E: Addition of United States Money

This is a type of example you will meet often after you leave school.

$ 7.25	$2304.05			$ 28.17
428.36	6.75		$ .79	3.68
.98	47.98	$ .37	.25	409.15
54.77	21.36	1.98	1.39	6.05
3.64	315.39	1218.53	6.95	.86

$ 68.00			$ .46	
3.75	$377.17		.28	$7864.31
7855.34	9.98		3.15	.47
168.97	12.72	$298.67	4.70	9.29
.52	17.24	24.79	80.09	4.06

GOALS: *Excellent, 9.* *Good, 8.* *Passing, 7.*

Practice Test 9 F: Addition of Decimals

Copy and add. Watch the decimal points.

1. 70.56 + 36.7 + 97 + 23.707 =
2. 82 + 246.8 + 307.24 + 35.035 + 90 =
3. 73.503 + 84 + .028 + 61.4 + 76.47 + 547.3 =
4. 20.05 + .06 + 38.345 + 70.084 + 505 =
5. 438.6 + 407 + 30.08 + 200.06 =
6. 7.3 + 36.06 + 60 + 29.6 + 39.6 =
7. 7.8 + 6.024 + 5.606 =
8. 70.6 + 490.5 + .08 + 2.4 + 505.6 =
9. 86.6 + 40.76 + 9.8 + 63.074 =
10. 2.26 + 3.08 + 3.5 =

GOALS: *Excellent, 9.* *Good, 8.* *Passing, 7.*

Practice Test 9 G: Subtraction of Decimals

1. .7 − .4 =
2. .95 − .77 =
3. .81 − .27 =
4. .47 − .28 =
5. 3.3 − 1.8 =
6. 6.3 − 2.3 =
7. 978.65 − 256.39 =
8. 37.246 − 17.758 =
9. 639.33 − .25 =
10. 6.4 − 3.8 =
11. 5 − 3.6 =
12. 7.3 − 3 =

GOALS: *Excellent, 11.* *Good, 10.* *Passing, 9.*

Practice Test 10 A: Multiplication of Decimals

1. 1000 × 7.6543 =
2. .97 × 100 =
3. 2.8 × .1 =
4. 100 × .245 =
5. 2.07 × 10 =
6. .01 × 23.7 =
7. .001 × 13 =
8. 1000 × .12 =
9. 100 × .01 =
10. 72 × .001 =
11. .1 × 100 =
12. .001 × 22 =
13. .01 × .01 =
14. 100 × .7 =
15. 26 × .01 =

(Continued on page 417)

(Continued from page 416)

16. 3.5 × .1 =
17. 2.6 × .01 =
18. 10 × .3 =
19. 1000 × .4 =
20. .01 × 271 =
21. 100 × 7.8 =
22. .7 × 100 =
23. 10 × .123 =
24. .001 × 28 =
25. .1 × 36.35 =
26. .728 × .001 =
27. .1 × 800 =
28. 16.4 × 100 =
29. 2.39 × 1000 =
30. .74 × .01 =

GOALS: *Excellent, 29.* *Good, 25.* *Passing, 21.*

Practice Test 10 B: Multiplication — Pointing Off

1. 6.0 × 8.0 = 4800
2. 7.0 × .7 = 490
3. 2.1 × 0.8 = 168
4. .40 × .70 = 2800
5. 20 × .20 = 400
6. 200 × .03 = 600
7. .08 × 900 = 7200
8. .03 × 50 = 150
9. 1.5 × 15 = 225
10. 2.5 × 2.5 = 625
11. 21.4 × 13 = 2782
12. 65 × 6.5 = 4225
13. .04 × .8 = 32
14. .70 × .03 = 210
15. .06 × 3.6 = 216
16. 7 × 4.8 = 336
17. 29 × .45 = 1305
18. 6.6 × 1.5 = 990
19. 4.0 × .3 = 120
20. 0.9 × 9.0 = 810
21. 2375 × .6 = 14250
22. 1.78 × .6 = 1068
23. 4.25 × .2 = 850
24. 29.75 × .08 = 23800
25. 1.2 × 12 = 144
26. 28.28 × .05 = 14140
27. .02 × 20 = 40
28. 3.16 × .6 = 1896
29. .09 × 600 = 5400
30. 6.15 × .7 = 4305
31. 200 × .01 = 200
32. 7.0 × 3.0 = 2100
33. 30 × .30 = 900
34. 8.0 × .8 = 640
35. 2.4 × 0.4 = 96
36. .30 × 6.0 = 1800

GOALS: *Excellent, 35.* *Good, 31.* *Passing, 25.*

Practice Test 10 C: Division of Decimals

$.3\overline{)27.33}$ $.7\overline{)17.5}$ $.3\overline{)7305}$ $.4\overline{)3936}$ $6000\overline{).9}$

$.3\overline{).609}$ $.04\overline{)20.04}$ $3\overline{)72.12}$ $.2\overline{)617.6}$ $300\overline{).06}$

$.6\overline{)33.24}$ $.5\overline{)8.75}$ $.06\overline{)2.688}$ $.04\overline{)33.4}$ $30\overline{).09}$

$.02\overline{)671}$ $.4\overline{)28.28}$ $1.5\overline{)3.75}$ $.06\overline{)423.6}$ $.03\overline{)12}$

Goals: *Excellent, 19.* *Good, 17.* *Passing, 15.*

Practice Test 10 D: Division — Pointing Off

1. $\begin{array}{r}129\\14.3\overline{)1.8447}\end{array}$

2. $\begin{array}{r}1\ 29\\.143\overline{)184.47}\end{array}$

3. $\begin{array}{r}129\\14.3\overline{)18447}\end{array}$

4. $\begin{array}{r}1\ 29\\1.43\overline{)184.47}\end{array}$

5. $\begin{array}{r}129\\143\overline{)1.8447}\end{array}$

6. $\begin{array}{r}129\\.0143\overline{).18447}\end{array}$

7. $\begin{array}{r}500\\1.2\overline{)6000}\end{array}$

8. $\begin{array}{r}500\\12\overline{)6000}\end{array}$

9. $\begin{array}{r}1\ 29\\14.3\overline{)184.47}\end{array}$

10. $\begin{array}{r}129\\143\overline{)18.447}\end{array}$

11. $\begin{array}{r}129\\1.43\overline{)1.8447}\end{array}$

12. $\begin{array}{r}1\ 29\\143\overline{)184.47}\end{array}$

13. $\begin{array}{r}129\\.143\overline{).18447}\end{array}$

14. $\begin{array}{r}500\\.0012\overline{)6000}\end{array}$

15. $\begin{array}{r}500\\.012\overline{)6000}\end{array}$

16. $\begin{array}{r}500\\.12\overline{)6000}\end{array}$

17. $\begin{array}{r}129\\.143\overline{)1.8447}\end{array}$

18. $\begin{array}{r}1\ 29\\.0143\overline{)184.47}\end{array}$

19. $\begin{array}{r}12\ 9\\14.3\overline{)1844.7}\end{array}$

20. $\begin{array}{r}129\\1.43\overline{)18.447}\end{array}$

21. $\begin{array}{r}129\\1.43\overline{)18447}\end{array}$

22. $\begin{array}{r}5\\.003\overline{)15}\end{array}$

23. $\begin{array}{r}2\ 75\\.235\overline{)646.25}\end{array}$

24. $\begin{array}{r}275\\235\overline{)64.625}\end{array}$

25. $\begin{array}{r}275\\2.35\overline{)6.4625}\end{array}$

26. $\begin{array}{r}275\\2.35\overline{)64625}\end{array}$

27. $\begin{array}{r}275\\23.5\overline{)64.625}\end{array}$

28. $\begin{array}{r}45\\.365\overline{)16425}\end{array}$

29. $\begin{array}{r}36\ 8\\.49\overline{)1803.2}\end{array}$

30. $\begin{array}{r}368\\.049\overline{)18.032}\end{array}$

31. $\begin{array}{r}8\\.76\overline{).00608}\end{array}$

32. $\begin{array}{r}8\\.76\overline{)6.08}\end{array}$

33. $\begin{array}{r}18\\2.12\overline{)3.816}\end{array}$

Goals: *Excellent, 32.* *Good, 29.* *Passing, 25.*

Per Cent Practice

If you did not pass Inventory Test 11, 12, 13, or 14, practice on the corresponding tests on per cents as often as you need to reach your goal. Allow 4 minutes for each Practice Test. Answers on pages 431–432.

Practice Test 11 A: Fractions and Decimals as Per Cents

Write each of the following as a per cent:

$\frac{1}{4}$	$\frac{5}{8}$	$\frac{3}{5}$	$\frac{7}{10}$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{4}{5}$
$\frac{3}{10}$	$\frac{3}{4}$	$\frac{1}{8}$	$\frac{3}{6}$	$\frac{1}{3}$	$\frac{3}{8}$	$\frac{9}{10}$
$\frac{1}{6}$	$\frac{1}{3}$	$\frac{4}{5}$	$\frac{1}{6}$	$\frac{5}{6}$	$\frac{7}{8}$	$4\frac{1}{5}$
.625	.403	.065	.01	.52	.004	.865
.6	.125	.40	.38	.7	.252	.027
.825	.75	.09	.26	.55	.63	.819

GOALS: *Excellent, 40.* *Good, 38.* *Passing, 36.*

Practice Test 11 B: Per Cents as Fractions

Write these per cents as decimal fractions:

2%	5.1%	16%	14.5%	300%
25%	87%	2.35%	78%	245%
.6%	30%	220%	2.45%	.01%
27%	4%	2.8%	.4%	205%

Write these per cents as common fractions or as mixed numbers:

25%	$12\frac{1}{2}$%	$83\frac{1}{3}$%	50%	575%
30%	$66\frac{2}{3}$%	10%	95%	$12\frac{1}{2}$%
$116\frac{2}{3}$%	$33\frac{1}{3}$%	70%	160%	40%
$37\frac{1}{2}$%	125%	$16\frac{2}{3}$%	$87\frac{1}{2}$%	$8\frac{1}{3}$%

GOALS: *Excellent, 38.* *Good, 35.* *Passing, 32.*

Practice Test 12 A: Equivalents

Copy only the correct values in the parentheses.

1. 40% equals $\left(\frac{40}{100},\ 0.04,\ \frac{4}{100},\ .040,\ \frac{2}{5}\right)$
2. $\frac{2}{3}$ equals $\left(66\frac{2}{3},\ \frac{20}{30},\ .66,\ \frac{66\frac{2}{3}}{100}\right)$
3. 25% equals $\left(.2\frac{1}{2},\ \frac{25}{1000},\ .25,\ \frac{2.5}{10}\right)$
4. $\frac{2}{5}$ equals $\left(.40,\ \frac{40}{100},\ \frac{20}{50},\ 40\%\right)$
5. $\frac{1}{3}$ equals $\left(.335,\ \frac{33}{100},\ \frac{33\frac{1}{3}}{100},\ 33\frac{1}{3}\%\right)$
6. $87\frac{1}{2}\%$ equals $\left(\frac{6}{9},\ .87\frac{1}{2},\ \frac{875}{1000},\ \frac{7}{8}\right)$
7. $\frac{3}{4}$ equals $\left(\frac{750}{1000},\ 75\%,\ \frac{300}{400},\ .075\right)$
8. $12\frac{1}{2}\%$ equals $\left(.12\frac{1}{2},\ \frac{1}{8},\ \frac{12\frac{1}{2}}{100},\ \frac{3}{16}\right)$
9. $\frac{3}{16}$ equals $\left(18\frac{3}{4}\%,\ .18\frac{3}{4},\ .018\frac{3}{4},\ \frac{18\frac{3}{4}}{100}\right)$
10. 10% equals $\left(\frac{10}{100},\ .10,\ 0.010,\ \frac{1}{10}\right)$

GOALS: *Excellent, 10.* *Good, 9.* *Passing, 7.*

Practice Test 13 A: Per Cent of a Number

68% of 724 =

.9% of 630 =

300% of 56 =

$2\frac{1}{5}\%$ of 72 =

7% of 35 =

4.3% of 600 =

3.75% of 50 =

9% of 90 =

3% of 86 =

65% of 765 =

153% of 95 =

24% of 270 =

35% of 720 =

8% of 900 =

$\frac{3}{8}\%$ of 350 =

28% of 70 =

.6% of 20 =

2.75% of 45 =

52% of 36 =

330% of 75 =

24% of 94 =

GOALS: *Excellent, 20.* *Good, 18.* *Passing, 16.*

Practice Test 14 A: Per Cent One Number Is of Another

1. What per cent of 24 is 8?
2. What per cent of 60 is 6?
3. 25 is what per cent of 20?
4. What per cent of 20 is 4?
5. 9 is what per cent of 18?
6. 8 is what per cent of 80?
7. What per cent of 48 is 16?
8. What per cent of 80 is 8?
9. What per cent of 20 is 30?
10. 4 is what per cent of 16?
11. 7 is what per cent of 14?
12. 12 is what per cent of 60?
13. What per cent of 72 is 5?
14. 6 is what per cent of 96?
15. 24 is what per cent of 36?
16. What per cent of 68 is 42?

GOALS: *Excellent, 15.* *Good, 13.* *Passing, 11.*

ANSWERS TO INVENTORY TESTS

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Inventory Test 1: Addition of Whole Numbers

15 15 11 17 7 14 15 12 13 14
16 16 12 10 15 11 16 13 18 13
33 74 55 33 45
66 32 27 63 85
41 37 44 38 3171 50881

Pages 84–85

Inventory Test 2: Multiplication of Whole Numbers

48 36 0 35 81 32 0 28 63 0
28 0 42 0 24 64 35 72 54 72
42000 24360 35150 39468 420000
24500 22348 24640 165186

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Inventory Test 3: Subtraction of Whole Numbers

5 7 7 7 6 3 6 8 9 5
8 6 5 4 8 6 4 8 8 8
7 9 6 0 9 9 9 5 3 7
59 11 43 542 189 606 557
159 558 396 47 18174
729279 89311 392768 164677

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Inventory Test 4: Division of Whole Numbers

7 6 7 4 8 0
7 7 6 8 5 1
6 6 9 0 6 9
8 0 $76\frac{1}{3}$ $58\frac{1}{4}$ 40 46
$72\frac{3}{7}$ $58\frac{1}{4}$ $24\frac{1}{14}$ $60\frac{16}{73}$
63 56 $64\frac{5}{14}$ 31

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Inventory Test 5: Changing the Form of a Fraction

$4\frac{2}{3}$ $3\frac{2}{5}$ $3\frac{1}{2}$ $3\frac{4}{5}$ $5\frac{1}{4}$ $7\frac{2}{9}$ $3\frac{1}{8}$ $1\frac{3}{13}$

$2\frac{11}{15}$ $2\frac{1}{12}$ 4 12 8 2 $1\frac{1}{6}$ $1\frac{2}{3}$

$\frac{22}{3}$ $\frac{79}{7}$ $\frac{31}{4}$ $\frac{15}{8}$ $\frac{23}{6}$

$\frac{13}{5}$ $\frac{37}{8}$ $\frac{19}{2}$ $\frac{53}{12}$

$\frac{2}{6}$ $\frac{21}{24}$ $\frac{10}{18}$ $\frac{4}{8}$ $\frac{15}{40}$

$\frac{60}{100}$ $\frac{30}{40}$ $\frac{8}{12}$ $\frac{16}{20}$ $\frac{20}{24}$

6ths, 6ths, 4ths, 9ths, 15ths, 7ths, 12ths, 12ths, 6ths, 8ths, 18ths, 12ths, 12ths, 10ths.

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Inventory Test 6: Addition of Fractions

$1\frac{1}{6}$ $1\frac{1}{2}$ $\frac{7}{8}$ $\frac{13}{16}$ $1\frac{5}{8}$ $1\frac{7}{24}$ $1\frac{5}{24}$

$1\frac{3}{20}$ $1\frac{1}{2}$ $\frac{17}{21}$

$1\frac{3}{4}$ $1\frac{3}{16}$

$1\frac{13}{24}$ $12\frac{1}{4}$ $16\frac{3}{10}$

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Inventory Test 7: Subtraction of Fractions

$\frac{1}{8}$ $\frac{11}{21}$ $\frac{5}{24}$ $\frac{1}{42}$ $\frac{11}{20}$ $\frac{4}{9}$ $\frac{9}{40}$ $\frac{3}{20}$

$\frac{5}{24}$ $\frac{4}{9}$ $\frac{1}{6}$ $\frac{23}{60}$

$\frac{1}{20}$ $\frac{3}{16}$ $\frac{17}{63}$ $\frac{1}{15}$

$5\frac{1}{6}$ $1\frac{7}{8}$ $10\frac{3}{4}$ $1\frac{10}{21}$

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Inventory Test 8: Multiplication and Division of Fractions

6 $3\frac{13}{25}$ $1\frac{1}{6}$ $5\frac{3}{8}$

$\frac{1}{8}$ $6\frac{8}{9}$ $\frac{18}{25}$ $10\frac{2}{5}$

$41\frac{2}{3}$ $23\frac{4}{5}$ 19

18 7 $7\frac{2}{3}$

32 $\frac{13}{18}$ $\frac{11}{36}$

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Inventory Test 9: Decimal Fractions

1. .6, .42, .07
2. .564, .2, .07
3. $.\frac{1}{3}$
4. $.\frac{4}{5}$
5. \$.25
6. \$.40
7. 273.3
8. 14.8
9. 4.67
10. 25.974

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Inventory Test 10: Multiplication and Division of Decimals

1. 6.00
2. 234
3. 3.00
4. 2.34
5. 2.100
6. .81
7. 23.4
8. 2340
9. 2.10
10. 2.34
11. 234
12. 3.20
13. 746.0
14. 23.4
15. 4.375
16. 2.34
17. .30
18. .234
19. 2.34
20. 9.00
21. .774
22. 23.4
23. 1.9635
24. .00234

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Inventory Test 11: Fractions, Decimals, and Per Cents

1. 3%
2. 60%
3. $62\frac{1}{2}\%$
4. 75%
5. $7\frac{1}{2}\%$
6. 80%
7. $33\frac{1}{3}\%$
8. $37\frac{1}{2}\%$
9. 20%
10. $87\frac{1}{2}\%$
11. .3
12. .25
13. .4
14. .06
15. .6
16. .125
17. .075
18. .07
19. .125
20. .375
21. $\frac{1}{5}$
22. $\frac{9}{100}$
23. $\frac{1}{4}$
24. $\frac{1}{8}$
25. $\frac{1}{3}$

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Inventory Test 12: Recognizing Equivalents

1. $\frac{60}{100}$, $\frac{3}{5}$, 0.6
2. $\frac{3}{8}$, .375, $\frac{375}{1000}$
3. $.7\frac{1}{2}$, .75, $\frac{7.5}{10}$
4. $0.062\frac{1}{2}$, $.06\frac{1}{4}$
5. 0.3, $\frac{300}{1000}$, .30, $\frac{30}{100}$
6. $\frac{87.5}{100}$, $.87\frac{1}{2}$, $\frac{875}{1000}$
7. $\frac{2}{24}$, $8\frac{1}{3}\%$
8. less than $\frac{1}{4}$, greater than $\frac{1}{6}$
9. $\frac{40}{100}$
10. $16\frac{2}{3}\%$

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Inventory Test 13: Per Cent of a Number

10
126
24
2747.50
1000
20

30
20
7
600
221
245

8
25
56
195
648
.203

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Inventory Test 14: Per Cent One Number Is of Another

1. $\frac{1}{3}$
2. $\frac{1}{2}$
3. $\frac{1}{4}$
4. $\frac{1}{5}$
5. $33\frac{1}{3}\%$
6. 300%
7. 90%
8. 80%
9. $\frac{1}{5}$
10. $\frac{1}{5}$
11. $\frac{1}{4}$
12. $\frac{1}{2}$
13. $\frac{2}{5}$
14. $\frac{3}{5}$
15. $66\frac{2}{3}\%$
16. 20%
17. 25%
18. 100%
19. 25%
20. 200%

ANSWERS TO PRACTICE TESTS

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Practice Test 1 A: Adding by Endings

65	54	94	103	44
82	82	63	62	54
33	82	93	35	36
41	101	51	42	66
62	63	101	35	33
92	93	73	62	61
35	83	33	32	83
93	32	63	70	53
43	54	93	30	

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Practice Test 1 B: Single-Column Addition

37	36	40	37	36	38	34	37	40	42
39	36	37	37	33	39	38	41	44	32

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Practice Test 1 C: Triple-Column Addition

3071	2004	3126	2573	4101	3263	2389

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Practice Test 1 D: Broken-Column Addition

48459	4907	36165	12358	5122
4931	5230	8671	6138	7822

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Practice Test 2 A: Multiplication — Two Places

24640	14112	14040	53940	32384
19228	23040	38352	43710	78182
28380	15782	10580	32923	16800

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Practice Test 2 B: Multiplication — Large Numbers

400000	183600	14060	660000	8200	439873
406131	264880	124285	207274	240575	10332

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Practice Test 3 A: Subtracting with "Borrowing"

18	26	7	12	15	8	179
537	324	633	748	785	638	463
559	798	82	873	47	138	142
570	339	138	506	27	474	194
	393	616		42	398	

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Practice Test 3 B: Subtraction — Large Numbers

19209	8076	714581	136929
592333	425092	780623	13913
7446	58857	677294	232619
24886	929687	37399	194604

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Practice Test 4 A: Long Division

97	84	74	63
28	39	$58\frac{6}{17}$	19
86	14	34	89

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Practice Test 4 B: Harder Long Division

37	0	139	$101\frac{2}{7}$
27	$23\frac{9}{47}$	$17\frac{1}{14}$	$50\frac{1}{11}$
$81\frac{1}{2}$	$7\frac{9}{92}$	36	72
$31\frac{1}{9}$	33	$36\frac{4}{27}$	23

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Practice Test 5 A: Changing Fractions

1	3	$10\frac{1}{2}$	1	2	$2\frac{1}{5}$	5	4	2
$4\frac{2}{7}$	$1\frac{1}{3}$	$3\frac{4}{5}$	$5\frac{1}{3}$	9	$1\frac{3}{5}$	1	$6\frac{2}{5}$	$1\frac{1}{7}$
$16\frac{3}{4}$	$20\frac{1}{3}$	7	$12\frac{1}{3}$	10	6	$9\frac{1}{3}$	$7\frac{3}{8}$	$12\frac{1}{2}$
$9\frac{2}{5}$	25	23	$31\frac{1}{3}$	$3\frac{2}{9}$	$28\frac{2}{3}$	7	$4\frac{5}{8}$	$3\frac{2}{5}$
$1\frac{5}{6}$	$1\frac{3}{4}$	$1\frac{1}{2}$	$3\frac{2}{3}$	$6\frac{1}{8}$	$8\frac{2}{3}$	14	$2\frac{1}{3}$	$9\frac{1}{5}$
$4\frac{4}{7}$	$1\frac{1}{2}$	$6\frac{5}{7}$	$4\frac{1}{2}$	6	$4\frac{1}{5}$	$12\frac{3}{5}$	$4\frac{2}{5}$	$4\frac{1}{8}$
7	$5\frac{2}{9}$	$6\frac{1}{2}$	$3\frac{2}{7}$	$5\frac{6}{7}$	2	$1\frac{2}{5}$	$4\frac{2}{9}$	$8\frac{5}{6}$

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Practice Test 5 B: Changing Whole or Mixed Numbers to Improper Fractions

$\frac{29}{4}$	$\frac{41}{3}$	$\frac{17}{4}$	$\frac{35}{7}$	$\frac{11}{3}$
$\frac{21}{8}$	$\frac{79}{7}$	$\frac{9}{3}$	$\frac{41}{8}$	$\frac{24}{5}$
$\frac{85}{8}$	$\frac{49}{5}$	$\frac{175}{2}$	$\frac{31}{8}$	$\frac{20}{11}$
$\frac{18}{3}$	$\frac{25}{4}$	$\frac{68}{7}$	$\frac{61}{9}$	$\frac{24}{12}$
$\frac{11}{5}$	$\frac{25}{3}$	$\frac{19}{2}$	$\frac{29}{6}$	$\frac{17}{3}$
$\frac{15}{4}$	$\frac{64}{9}$	$\frac{20}{3}$	$\frac{25}{2}$	$\frac{7}{2}$
$\frac{15}{2}$	$\frac{23}{4}$	$\frac{11}{6}$	$\frac{43}{9}$	$\frac{37}{6}$

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Practice Test 5 C:
Changing Fractions to Equal Fractions

8	9	49	5	42
4	3	56	16	27
15	6	30	25	60
3	20	12	22	18
6	20	2	34	50
9	6	9	7	35
15	10	20	42	18
4	12	12	21	50
6	21	28	16	45
8	18	45	18	24
10	10	27	9	22
3	6	18	30	40

Pages 409–410

Practice Test 5 D:
Choosing the Least Common Denominator

6ths, 10ths, 15ths, 20ths, 15ths, 4ths, 6ths, 6ths, 24ths, 20ths, 56ths, 12ths, 40ths, 8ths, 8ths, 30ths, 4ths, 60ths, 90ths, 6ths, 24ths, 36ths, 20ths, 24ths, 84ths, 45ths, 24ths, 24ths, 36ths, 28ths, 60ths, 56ths, 45ths.

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Practice Test 6 A:
Adding Two Fractions — Vertical

$\frac{11}{14}$	$1\frac{1}{8}$	$1\frac{1}{6}$	$\frac{11}{30}$	$\frac{13}{21}$	$1\frac{3}{40}$	$\frac{13}{16}$	$\frac{4}{15}$
$\frac{7}{8}$	$1\frac{1}{3}$	$\frac{3}{4}$	$\frac{17}{36}$	$1\frac{7}{18}$	$1\frac{9}{20}$	$1\frac{1}{10}$	$1\frac{11}{24}$

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Practice Test 6 B:
Adding Two Fractions — Horizontal

$1\frac{2}{15}$	$1\frac{1}{8}$	$1\frac{8}{15}$	$\frac{22}{35}$
$\frac{7}{12}$	$\frac{35}{36}$	$1\frac{25}{44}$	$1\frac{5}{33}$
$1\frac{7}{24}$	$1\frac{11}{20}$	$1\frac{7}{24}$	$\frac{35}{36}$
$1\frac{9}{20}$	$1\frac{1}{12}$	$\frac{33}{35}$	$1\frac{3}{10}$

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Practice Test 6 C:
Adding Three Fractions — Horizontal

$1\frac{7}{8}$	$1\frac{1}{7}$	$1\frac{19}{24}$	$1\frac{29}{30}$
$\frac{23}{40}$	$1\frac{1}{48}$	$1\frac{2}{21}$	$1\frac{29}{30}$
$1\frac{19}{24}$	$2\frac{1}{20}$	$2\frac{3}{10}$	$1\frac{7}{18}$

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Practice Test 6 D:
Adding Two Mixed Numbers

$11\frac{2}{15}$	$9\frac{9}{10}$	$5\frac{13}{16}$	$10\frac{14}{15}$	$6\frac{11}{24}$	$11\frac{1}{15}$
$12\frac{13}{20}$	$11\frac{7}{8}$	$13\frac{11}{12}$	$6\frac{1}{4}$	12	$12\frac{17}{24}$

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Practice Test 7 A:
Subtraction of Fractions — Vertical

$\frac{1}{14}$	$\frac{7}{45}$	$\frac{5}{16}$	$\frac{7}{18}$	$\frac{7}{12}$	$\frac{1}{12}$	$\frac{2}{15}$	$\frac{13}{24}$	0	$\frac{1}{10}$
$\frac{4}{45}$	$\frac{1}{4}$	$\frac{1}{40}$	$\frac{11}{18}$	$\frac{7}{15}$	$\frac{4}{15}$	$\frac{1}{12}$	$\frac{5}{16}$	$\frac{3}{10}$	$\frac{5}{24}$

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Practice Test 7 B:
Subtraction of Fractions — Horizontal

$\frac{3}{10}$	$\frac{5}{14}$	$\frac{7}{30}$	$\frac{11}{18}$
$\frac{4}{15}$	$\frac{1}{6}$	$\frac{29}{63}$	$\frac{7}{15}$
$\frac{1}{6}$	$\frac{7}{18}$	$\frac{1}{24}$	$\frac{3}{8}$
$\frac{2}{15}$	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{4}{21}$
0	$\frac{3}{5}$	$\frac{11}{24}$	$\frac{3}{16}$
$\frac{5}{12}$	$\frac{7}{16}$	$\frac{7}{24}$	$\frac{3}{10}$

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Practice Test 7 C:
Subtraction of Mixed Numbers

$\frac{33}{40}$	$2\frac{5}{12}$	$2\frac{1}{4}$	$3\frac{1}{9}$	$6\frac{5}{24}$	$1\frac{2}{3}$
$4\frac{16}{21}$	$1\frac{19}{40}$	$3\frac{1}{6}$	$7\frac{1}{6}$	$3\frac{1}{8}$	$1\frac{3}{10}$

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Practice Test 8 A:
Multiplication of Fractions

$\frac{7}{10}$	$\frac{3}{5}$	$\frac{2}{3}$	$\frac{1}{16}$
$\frac{2}{7}$	$\frac{4}{11}$	$\frac{2}{7}$	$13\frac{1}{2}$
$\frac{7}{9}$	$\frac{3}{32}$	$\frac{15}{32}$	$\frac{5}{18}$
$\frac{1}{10}$	$\frac{2}{3}$	$\frac{1}{8}$	4
$\frac{1}{2}$	36	$26\frac{2}{3}$	$1\frac{1}{6}$

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Practice Test 8 B:
Multiplication of Mixed Numbers

$3\frac{5}{9}$	$4\frac{29}{40}$	$1\frac{1}{4}$
$69\frac{2}{3}$	$1\frac{2}{3}$	$1\frac{1}{9}$
$18\frac{3}{4}$	$5\frac{1}{5}$	$1\frac{1}{2}$
$31\frac{2}{3}$	12	$1\frac{3}{4}$

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Practice Test 8 C: Division of Fractions

2	$2\frac{4}{5}$	$13\frac{1}{2}$	$1\frac{1}{3}$	$9\frac{1}{3}$
$\frac{24}{25}$	$2\frac{2}{9}$	$1\frac{1}{3}$	2	$3\frac{4}{7}$
$1\frac{1}{24}$	$\frac{7}{9}$	$1\frac{1}{4}$	$\frac{3}{5}$	1
$2\frac{1}{2}$	$\frac{1}{18}$	54	$\frac{1}{18}$	$\frac{1}{32}$
$2\frac{4}{7}$	2	$1\frac{1}{16}$	$1\frac{1}{3}$	$\frac{4}{5}$

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Practice Test 8 D: Division with Mixed Numbers

$\frac{31}{5}$	$\frac{23}{10}$	$\frac{77}{8}$
$3\frac{2}{7}$	$17\frac{1}{2}$	14
$7\frac{1}{9}$	$2\frac{1}{4}$	$21\frac{7}{16}$
$7\frac{11}{25}$	7	$14\frac{2}{3}$

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Practice Test 9 A: Equivalent Fractions

$\frac{1}{2}$	$\frac{3}{5}$	.25
$\frac{25}{100}$	$\frac{875}{1000}$	$\frac{625}{1000}$
.875	$\frac{5}{8}$	$\frac{75}{100}$
$\frac{4}{5}$	$\frac{5}{10}$	$\frac{8}{10}$
.75	$\frac{375}{1000}$	$\frac{1}{4}$
.2	$\frac{3}{4}$	$\frac{2}{10}$

$\frac{75}{100}$ $\frac{3}{5}$

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Practice Test 9 B: The Meaning of a Decimal

.6, .30, .06	.63, .3, .143
.9, .81, .18	.9, .45, .234
.67, .6, .567	.80, .35, .3
.70, .575, .36	.70, .425, .2
.875, .87, .700	.81, .783, .077
.375, .26, .08	.6, .431, .09

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Practice Test 9 C: Changing Fractions to Decimals

.214	.555	.111	.444	.125	.750	.625	.583	.833
.318	.875	.187	.642	.291	.272	.777	.375	.533

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Practice Test 9 D: Fractional Parts of $1

$\frac{1}{2}$
$\frac{1}{8}$
$\frac{1}{16}$
$\frac{1}{5}$
$\frac{1}{3}$
$\frac{3}{8}$
$\frac{7}{20}$
$\frac{4}{5}$
\$.70
\$.37$\frac{1}{2}$
\$1.25
\$.08$\frac{1}{3}$
\$.25
\$.83$\frac{1}{3}$
\$.75
\$.16$\frac{2}{3}$
\$.62$\frac{1}{2}$

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Practice Test 9 E: Addition of United States Money

\$495.00
\$8096.58
\$2695.53
\$417.11
\$1220.88
\$323.46
\$9.38
\$88.68
\$447.91
\$7878.13

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Practice Test 9 F: Addition of Decimals

1. 227.967
2. 761.075
3. 842.701
4. 633.539
5. 1075.74
6. 172.56
7. 19.430
8. 1069.18
9. 200.234
10. 8.84

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Practice Test 9 G: Subtraction of Decimals

1. .3
2. .18
3. .54
4. .19
5. 1.5
6. 4.0
7. 722.26
8. 19.488
9. 639.08
10. 2.6
11. 1.4
12. 4.3

Pages 410–412

Practice Test 10 A: Multiplication of Decimals

1. 7654.3
2. 97.
3. .28
4. 24.5
5. 20.7
6. .237
7. .013
8. 120
9. 1
10. .072
11. 10
12. .022
13. .0001
14. 70
15. .26
16. .35
17. .026
18. 3.
19. 400
20. 2.71
21. 780
22. 70
23. 1.23
24. .028
25. 3.635
26. .000728
27. 80
28. 1640
29. 2390
30. .0074

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Practice Test 10 B: Multiplication — Pointing Off

1. 48.00
2. 4.90
3. 1.68
4. .2800
5. 4.0
6. 6.0
7. 72.00
8. 1.50
9. 22.5
10. 6.25
11. 278.2
12. 422.5
13. .032
14. .0210
15. .216
16. 33.6
17. 13.05
18. 9.90
19. 1.20
20. 8.10
21. 1425.0
22. 1.068
23. .850
24. 2.3800
25. 14.4
26. 1.4140
27. .40
28. 1.896
29. 54.00
30. 4.305
31. 2.00
32. 21.00
33. 9.00
34. 6.40
35. .96
36. 1.800

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Practice Test 10 C: Division of Decimals

91.1
2.03
55.4
33550
25
501
17.5
70.7
24350
24.04
44.8
2.5
9840
3088
835
7060
.00015
.0002
.003
400

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Practice Test 10 D: Division — Pointing Off

1. .129
2. 1290
3. 1290
4. 129
5. .0129
6. 12.9
7. 5000
8. 500
9. 12.9
10. .129
11. 1.29
12. 1.29
13. 1.29
14. 5,000,000
15. 500,000
16. 50,000
17. 12.9
18. 12900
19. 129
20. 12.9
21. 12900
22. 5000
23. 2750
24. .275
25. 2.75
26. 27,500
27. 2.75
28. 45000
29. 3680
30. 368
31. .008
32. 8
33. 1.8

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Practice Test 11 A: Fractions and Decimals as Per Cents

25%
30%
$16\frac{2}{3}\%$
62.5%
60%
82.5%
$62\frac{1}{2}\%$
75%
$33\frac{1}{3}\%$
40.3%
12.5%
75%
60%
$12\frac{1}{2}\%$
80%
6.5%
40%
9%
70%
50%
$16\frac{2}{3}\%$
1%
38%
26%
20%
$33\frac{1}{3}\%$
$83\frac{1}{3}\%$
52%
70%
55%
40%
$37\frac{1}{2}\%$
$87\frac{1}{2}\%$
.4%
25.2%
63%
80%
90%
420%
86.5%
2.7%
81.9%

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Practice Test 11 B: Per Cents as Fractions

.02	.051	.16	.145	3.00
.25	.87	.0235	.78	2.45
.006	.30	2.20	.0245	.0001
.27	.04	.028	.004	2.05
$\frac{1}{4}$	$\frac{1}{8}$	$\frac{5}{6}$	$\frac{1}{2}$	$5\frac{3}{4}$
$\frac{3}{10}$	$\frac{2}{3}$	$\frac{1}{10}$	$\frac{19}{20}$	$\frac{1}{8}$
$1\frac{1}{6}$	$\frac{1}{3}$	$\frac{7}{10}$	$1\frac{3}{5}$	$\frac{2}{5}$
$\frac{3}{8}$	$1\frac{1}{4}$	$\frac{1}{6}$	$\frac{7}{8}$	$\frac{1}{12}$

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Practice Test 12 A: Equivalents

1. $\frac{40}{100}, \frac{2}{5}$
2. $\frac{20}{30}, \frac{66\frac{2}{3}}{100}$
3. $.2\frac{1}{2}, .25, \frac{2.5}{10}$
4. $.40, \frac{40}{100}, \frac{20}{50}, 40\%$
5. $\frac{33\frac{1}{3}}{100}, 33\frac{1}{3}\%$
6. $.87\frac{1}{2}, \frac{875}{1000}, \frac{7}{8}$
7. $\frac{750}{1000}, 75\%, \frac{300}{400}$
8. $.12\frac{1}{2}, \frac{1}{8}, \frac{12\frac{1}{2}}{100}$
9. $18\frac{3}{4}\%, .18\frac{3}{4}, \frac{18\frac{3}{4}}{100}$
10. $\frac{10}{100}, .10, \frac{1}{10}$

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Practice Test 13 A: Per Cent of a Number

492.32	8.1	1.3125
5.67	2.58	19.6
168	497.25	.12
1.584	145.35	1.2375
2.45	64.8	18.72
25.8	252	247.50
1.875	72	22.56

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Practice Test 14 A: Per Cent One Number Is of Another

1. $33\frac{1}{3}\%$
2 10%
3. 125%
4. 20%
5. 50%
6. 10%
7. $33\frac{1}{3}\%$
8. 10%
9. 150%
10. 25%
11. 50%
12. 20%
13. $6\frac{17}{18}\%$
14. $6\frac{1}{4}\%$
15. $66\frac{2}{3}\%$
16. $61\frac{13}{17}\%$

TABLES FOR REFERENCE

LINEAR MEASURE OR MEASURES OF LENGTH

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
5.5 yards = 1 rod (rd.)
320 rods = 1 mile (mi.)
A mile = 320 rd. = 1760 yd. = 5280 ft. = 1.61 kilometers

SQUARE MEASURE OR MEASURES OF SURFACE

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
30.25 square yards = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)
640 acres = 1 square mile (sq. mi.)
36 square miles = a township (tp.)
An acre = 160 sq. rd. = 4840 sq. yd. = 43,560 sq. ft.

CUBIC MEASURE OR MEASURES OF VOLUME

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)
128 cubic feet = 1 cord of wood of 4-ft. length

IMPORTANT VOLUME EQUIVALENTS

1 cubic foot = 7.5 gallons (gal.)
1 cubic foot of water = 62.5 pounds (lb.)
1 cubic foot = 0.8 bushel (bu.)
1 gallon = 231 cubic inches (cu. in.)
1 gallon of water = $8\frac{1}{3}$ pounds (lb.)
1 cubic foot of ice = $56\frac{1}{4}$ pounds (lb.)

MEASURES OF WEIGHT

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2000 pounds = 1 ton (T.)
2240 pounds = 1 long ton
One pound Avoirdupois = 7000 grains (gr.)

LIQUID MEASURES

4 gills (gi.) = 1 pint (pt.)
16 fluid oz. = 1 pint
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
31.5 gallons = 1 barrel (bbl.)
2 barrels = 1 hogshead (hhd.)

DRY MEASURES

2 pints (pt.) = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)
2½ bushels = 1 barrel (bbl.)

CONVENIENT UNITS FOR THE KITCHEN

3 teaspoonfuls (tsp.) = 1 tablespoonful (tbsp.)
2 tablespoonfuls = 1 fluid ounce
2 gills (½ pint) = 1 cup
4 cups flour = 1 pound (lb.)
2 tablespoonfuls sugar = 1 ounce (oz.)
2 cups granulated sugar = 1 pound (lb.)
2 cups butter, solid = 1 pound (lb.)

MEASURES CONVENIENT FOR PRACTICAL ESTIMATES

1 ton hard coal = 35 cubic feet
1 ton soft coal = 38 cubic feet
4000 cu. in. ear corn = 1 bushel shelled corn
196 pounds flour = 1 barrel
1 bu. shelled corn or rye = 56 lb.
1 bu. corn in ear = 70 lb.
1 bu. oats = 32 lb.
1 bu. wheat or potatoes = 60 lb.
1 bu. apples or peaches = 48 lb.

Legal weights vary in different states.

CONVENIENT RULES FOR THE FARMER

To find the number of —

(1) Bushels of corn in a crib: For old and dry corn take $\frac{4}{9}$ of the product of the three dimensions in feet.

(2) Bushels of wheat in a bin: Take .8 (or $\frac{4}{5}$) of the product of the three dimensions in feet. Another rule is divide the volume in cubic inches by 2150.

(3) Tons of hay in a mow: Measure the three dimensions in yards, find the product, and divide by 15 for well-packed hay. For new hay, which is less well packed, find the product of the three dimensions in yards and divide by 18.

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